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THE CONDOR

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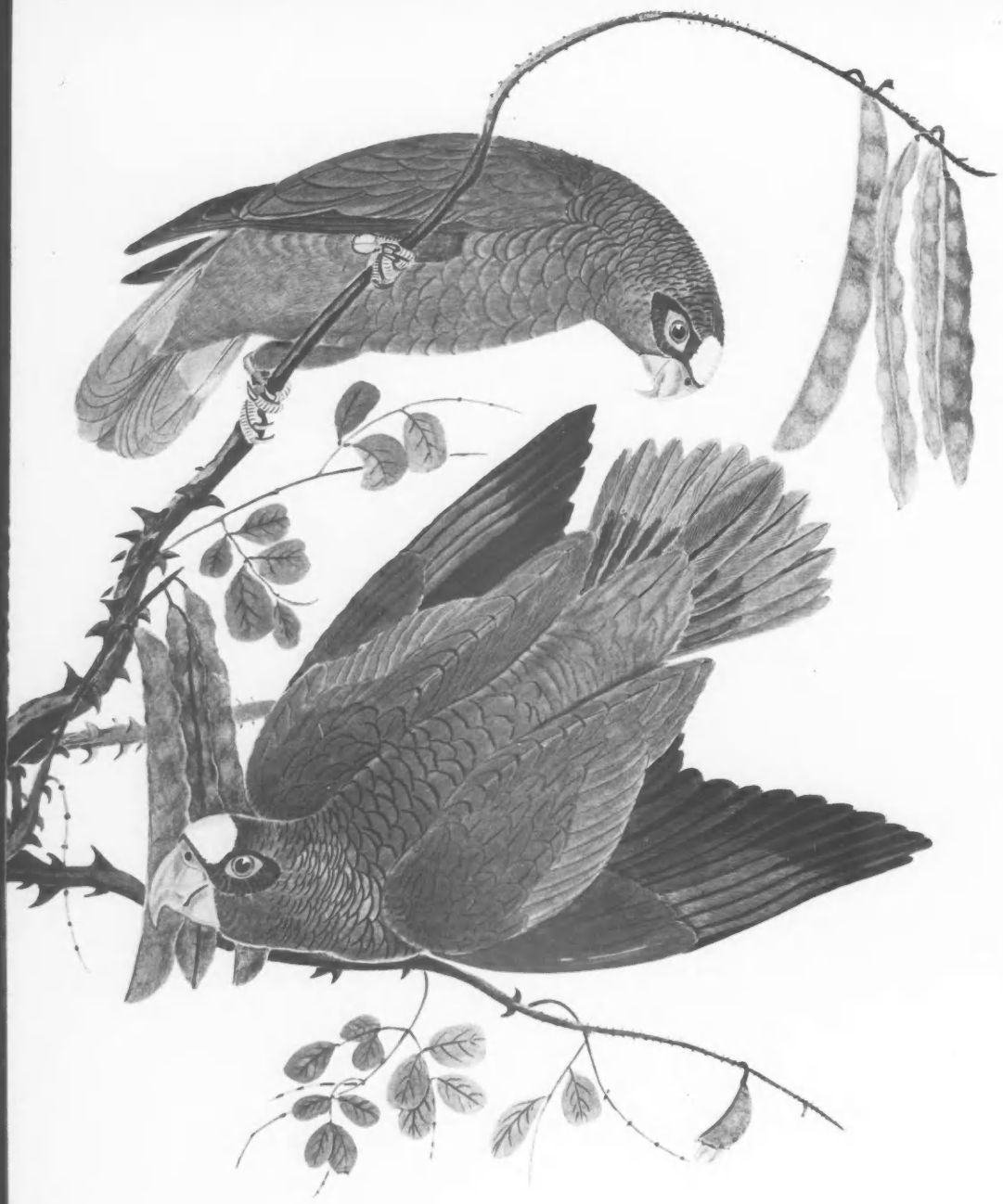

WHITE-FRONTED PARROT, *AMAZONA ALBIFRONS*
One-half Natural Size
Painting by Andrew Jackson Grayson

THE CONDOR

VOLUME 51 MARCH-APRIL, 1949 NUMBER 2

ANDREW JACKSON GRAYSON

By LOIS CHAMBERS TAYLOR

American ornithologists know Andrew Jackson Grayson as an early collector of western birds because of the several species and races named for him. Few realize, however, that he was also one of the earliest California pioneers, an astute observer of natural history, and a bird painter of exceptional ability. It is the objective of this short paper to provide a sketch of Grayson's life and work to accompany one of his paintings reproduced as the frontispiece of this issue of the Condor.

A brief account of Grayson's life by Walter E. Bryant published in 1891 in Zoe (vol. 2, pp. 34-68) provides the information that his bird paintings, together with his manuscript notes on natural history, journals, and miscellaneous papers were given to the Bancroft Library of the University of California by his widow. Bryant's article was called to my attention last year and after reading it, I was curious to see Grayson's paintings but was certainly not prepared to find them to be of such beauty and vitality.

The paintings are done in water color on bristol board and are bound in two volumes, folio size. There are 154 plates depicting approximately as many species. Grayson was a great admirer of Audubon, by whose style he was strongly influenced. He drew the birds in natural positions, on vegetation and against backgrounds characteristic of their habitats. Fruits, flowers and foliage are drawn with the same care given to the birds. Many of the paintings include landscapes. Frequently the birds are portrayed feeding or in other active behavior resulting in strong, spirited composition. The species drawn are Californian and western Mexican; most are Mexican. Among the Mexican species are some which, to my knowledge, have never been otherwise illustrated.

Grayson was born August 20, 1819, in the northwest corner of Louisiana, on the Ouachita River, where his father had a cotton plantation. That area was then sparsely populated; the region was one of bayous, stagnant lakes and cypress swamps. As a lad Grayson spent most of his time wandering in the woods, observing nature and making sketches of what he found. When he was about ten, a school was built and he started to attend. Teachers changed frequently and were poorly trained. One teacher punished the boy severely for drawing in school, and his father decided to send him to St. Mary's College in St. Louis, Missouri, where he was forbidden to study art.

A year after Grayson's return from college, his father died. Grayson invested his small inheritance in a store; but he spent most of his time in the woods and soon sold out. He had developed a desire to go west while in St. Louis, where he had met frontiersmen. So when he proposed to Miss Frances J. Timmons, he asked her to come to California with him. They were married July 21, 1842. In 1845, their only child, Edward B. Grayson, was born. They moved to St. Louis to prepare for the trip west.

On April 15, 1846, a party of emigrants with Grayson as leader set out from Independence, Missouri. Several other bands of emigrants were at Independence and they combined forces. At Fort Bridger, L. W. Hastings persuaded some of the emigrants to join him in following a new, shorter route. Grayson and some others elected to stay on the old route. The group that went with Hastings was the ill-fated Donner party.

Grayson's party safely reached Fort Hall, in what is now Idaho. Between there and the Sierra Nevada they had much trouble with Indians. Cattle were stolen, men and horses were killed. Grayson lost half of his team with the most difficult part of the journey ahead. He left his wagon with a friend, packed his horse with essential provisions, mounted his wife and baby on top, and set off on foot across the mountains. On October 12, 1846, they reached a point where they could look down into the valley of California.

As soon as they arrived in San Francisco, Grayson left his family with General Vallejo at Sonoma and volunteered in Fremont's army. He served with honor and achieved the rank of colonel.

After the war Grayson entered several business ventures in San Francisco and other towns in northern California. He started a store at the corner of Clay and Kearny streets in San Francisco. He founded the now forgotten town of Grayson or Graysonville on the San Joaquin River. He became a partner in a mercantile business in Stockton. Each of these projects was abandoned after a brief period. He bought property in San Francisco and a homesite in Marin County. The latter place, "The Thicket," he sold in 1852, when it passed into the hands of Lord Fairfax and eventually became the site of the town bearing this name.

In the fall of 1853 he joined a party sent to survey the Tulare plains. Upon his return Mrs. Grayson told him that the Mercantile Library in San Francisco had acquired a set of Audubon's "Birds of America." She had seen this work and could hardly wait to show it to him. She writes that from that day his life seemed to find its proper channel: He resolved to create such a work, if the balance of his life was to be spent completing it, and to call it "The Birds of the Pacific Slope." The Graysons had moved to San Jose, and here he began to teach himself in earnest to draw and paint and to prepare specimens.

When the second annual California state fair was held in Sacramento in 1855, Grayson exhibited drawings of three birds: the Tropic Bird, Wood Duck and Road-runner. He was awarded a silver cup. For the next two years he painted and noted the behavior of many California birds. The Hesperian Magazine published a few of his paintings as colored lithographs, but they were poor reproductions.

Meanwhile his hopes of profitable fruit-raising in the San Jose region were disappointed. He was badly in debt. He sold everything but his house and grounds, which he mortgaged and leased.

In March, 1857, he and his wife sailed on the schooner Mary Taylor for Mexico. Edward, their son, was in school in the East. Grayson was poor again, but his head was filled with a wonderful project. He expected to include the birds of western Mexico in his portfolios.

The ship was wrecked on the Mexican coast. His drawings, drawing paper and colors were ruined. Fortunately he was offered a surveying job on shore. This gave him an opportunity to make notes and sketches and to collect specimens. Back in San Francisco, Grayson was forced to sell the material he had gathered. Some of his specimens found their way into the Smithsonian Institution where Spencer Fullerton Baird became interested in this far western collector.

In 1859, Grayson decided to settle in Mazatlan with his family, and he remained in Mexico for nearly ten years, studying and drawing birds of the mainland and islands. During this time he performed his most important scientific work. He explored and collected on the Tres Marias, Socorro and Isabel islands. He contributed articles on his travels to newspapers in Mexico and California and to several early California magazines, most of which no longer are published. These appeared under his own name or under the pen names of "Wanderer," "Rambler," or "Occidentalus."

In March, 1866, Emperor Maximillian of Mexico granted Grayson a request for an interview. Both Maximillian and his empress, Carlotta, were delighted with Grayson's paintings and interested in his project. Through their enthusiasm a contract was arranged with the Imperial Academy of Science and Literature of Mexico. He was to receive $200 per month to enable him to carry on his work, at the conclusion of which it would be published in four languages, and in the costliest manner. In 1867, when Maximillian's ill-starred regime ended in revolution and his execution, the contract was repudiated. At this time, also, the Graysons suffered the untimely loss of their son.

Discouraged though he was, Grayson continued his work. In April, 1869, he left Mazatlan for the Isabel Islands between the Tres Marias Islands and San Blas. There he fell ill with a fever from which he died August 17, 1869, in his fiftieth year. He was buried in Mazatlan, but his remains were later brought back to San Francisco.

After her husband's death Mrs. Grayson made efforts to accomplish the publication of his paintings and notes. Baird was enthusiastic in his praise of Grayson and shared Mrs. Grayson's hope of getting his work published. But their efforts met with no success.

It is through the kindness of Dr. George P. Hammond, Director of the Bancroft Library, University of California, that the Cooper Ornithological Club is permitted to publish an example of Grayson's work, his painting of the White-fronted Parrot (*Amazona albifrons*). The male and female shown in the frontispiece are a pair collected in February, 1868, on the Rio Mazatlan, in Sinaloa. With this example of the brilliant painting and dynamic composition of Andrew Jackson Grayson before us, it is hard to believe that this artist's work could have lain unpublished and all but forgotten for almost a century.

Museum of Vertebrate Zoology, University of California, Berkeley, March 15, 1949.

DISTRIBUTIONAL HISTORY OF EURASIAN BULLFINCHES, GENUS *PYRRHULA*

By K. H. VOOUS

Recently I have tried to reconstruct the distributional and evolutionary history of the genus *Dendrocopos*, pied woodpeckers (Voous, 1947). The aim of the following study, which is an attempt to reconstruct the course of the same phenomena in the genus *Pyrrhula*, bullfinches, is to ascertain whether the conclusions arrived at in the case of the Palearctic and Oriental members of *Dendrocopos* have a general value. As in the work on *Dendrocopos*, patterns of recent geographical and ecological distribution and of character geography have furnished the basic facts of this study.

The genus *Pyrrhula* has been chosen as the subject of this study because (1) its characteristics, which are well defined, clearly set it apart from other genera; (2) it has only a few members; (3) its taxonomy as well as (4) its geographical distribution do not show conspicuous complications; and (5) its members are exclusive inhabitants of forests, although they regularly descend to the ground for feeding.

Only in the case of the European species was it necessary to make a thorough examination of subspecies. In preparing this part I had the privilege of collaborating with Mr. P. A. Clancey of Glasgow. I am greatly indebted to him for his kind help.

In this paper I have made use of the following terms as defined by Ripley (1945):

Interspecies: a species group or sympatric subgenus, containing a group of closely related, geographically overlapping species which have attained physiological isolation in nature.

Emergent interspecies: a species group containing a number of closely related, geographically overlapping species with a marginal fringe of hybridization.

Superspecies: a species group containing geographically representative species that have developed characters too distinct to permit the birds to be regarded as subspecies.

MATERIALS AND ACKNOWLEDGEMENTS

With the exception of one species (*aurantiaca*) I have seen specimens of all species of *Pyrrhula*. The total number of specimens examined is 180. These originate from the following museums and private collections, to the authorities of which I am greatly indebted: Amsterdam Museum, Dublin Museum, Leiden Museum, coll. Harrison, coll. Huber, coll. Ten Kate, coll. Sillem-Van Marle. In addition I have to thank the following persons for kind help or valuable information: A. Arcangeli (Turin), Tso-Hsin Cheng (Foochow), P. A. Clancey (Glasgow), E. Dottrens (Geneva), M. S. J. Engel-Ledeboer (Amsterdam), E. Fernández Galiano (Madrid), Director of Genoa Museum, P. Géroudet (Geneva), F. Gudmundsson (Reykjavik, Iceland), N. Gyldenstolpe (Stockholm), J. M. Harrison (Sevenoaks, Kent), J. Huber (Oberkirch, Switzerland), P. Jespersen (Charlottenlund, Denmark), H. Johansen (Copenhagen), G. C. A. Junge (Leiden), O. Kalela (Helsinki), C. G. B. ten Kate (Kampen, Netherlands), G. Laurent (Remomeix, France), B. Löppenthin (Copenhagen), J. D. MacDonald (London), J. G. van Marle (Bussum, Netherlands), N. Mayaud (Saumur, France), E. Mayr (New York), E. Moltoni (Milan), P. O'Connor (Dublin), M. Sassi (Vienna), A. W. Stelfox (Dublin). E. Stresemann (Berlin), E. Sutter (Basel), A. Wollebaek (Oslo).

CHARACTERS OF THE GENUS *PYRRHULA*

The bullfinches, genus *Pyrrhula*, are cardueline finches related to American goldfinches and purple finches. This genus is at once distinguished by the short, though strongly swollen bill, the short tarsi, the glossy black wing and tail feathers, and the white rump. The tail is distinctly or only very slightly forked and the wings are rather pointed. In most species the males show an orange or red coloration on the under parts. With only very few exceptions the bill is black, the legs and feet fleshy brown, and the irides

brown. A yellowish horn colored bill occurs in *P. nipalensis* (except in the race *waterstradti*) and in *P. leucogenys*. *P. n. waterstradti* is the only form of *Pyrrhula* having yellow irides.

THE ORIENTAL BULLFINCHES

Pyrrhula nipalensis Hodgson

Characters.—Head brown, no trace of black mask; tail forked; upper and under side some shade of dull brown, without any lipochromous pigmentation in the male; sexes alike in coloration except for the outer web of the innermost secondary, which is dark red in the male and yellow in the female.

Subspecific variation.—The following races have been described: *P. n. nipalensis* Hodgson 1836: Nepal; *P. n. waterstradti* Hartert 1902: Gunong Tahan, east Malay Peninsula; *P. n. ricketti* La Touche 1905: northwest Fukien, southern China; *P. n. victoriae* Rippon 1906: Mt. Victoria, Chin Hills (= *nipalensis* according to Stresemann and Heinrich, 1940); *P. n. uchidai* Kuroda 1916: southern Formosa.

The subspecific variation is very slight and refers to (1) a different degree of pigmentation of the upper parts, which are darker and browner in the birds from south China and from Formosa, and perhaps slightly lighter and greyer in birds from Mt. Victoria; (2) the coloration of the crown, which is dark and has a rather scaly appearance in birds from south China, caused by the relatively large dark centers of the crown feathers, but which is rather pale and hardly spotted in Malayan birds and intermediate in the remaining ones; (3) the extension of the white spot beneath and behind the eye, which is strongly developed in Malayan birds, but almost absent or rather duller in birds from south China; (4) the presence of a black chin, found only in the Formosan race; (5) the white shaft streak on the central rectrices of the Formosan birds, which is unique.

Range.—Himalayas, from Gilgit in the West, to Bhutan (Ludlow and Kinnear, 1944) and extreme northern Burma (Adung Valley and Irrawaddy–Salween Divide) (Stanford and Ticehurst, 1938; Stanford and Mayr, 1940) and northwest Yunnan (Rothschild, 1925 and 1926; Greenway, 1933) in the East. In addition, there are four or five isolated ranges: (1) Mt. Victoria, Chin Hills (Stresemann and Heinrich, 1940); (2) the mountains of northwest Fukien and northeast Kwantung (La Touche, 1925) which probably form one continuous area with northeast Tonkin, where the same subspecies has been recorded from Chapa by Delacour and Jabouille (1940); (3) Mt. Arizan in Formosa (Kuroda, 1935); (4) eastern Malayan mountains, in the states of Perak, Selangor and Pahang (Robinson, 1928).

Biotope.—Mountain forests, but in the Himalayas apparently generally lower than the zone in which *P. erythrocephala* occurs. Hence it inhabits the broad-leaved forests, rather than the coniferous ones. In the Tung-la Mountains of northwest Yunnan (Greenway, 1933), it is recorded from the fir and rhododendron zone, whereas on Mt. Victoria it inhabits chiefly the broad-leaved zone with evergreen trees covered with mosses, epiphytic ferns and orchids, and with a thick undergrowth. In the same region it has been found in the zone of oak and rhododendron, but it has been observed only rarely in coniferous forests (Stresemann and Heinrich, 1940). In the Malayan Mountains the habitat consists of a xerophytic zone (heath) on the summits of the mountains, where it often occurs in conifers like *Agathis* and *Dacrydium* (Robinson, 1928). In the Himalayas the species has been found breeding up to about 3000 m. altitude, as in the Tonglo Mountains, at the frontiers of Sikkim and Nepal (Baker, 1926); but in Bhutan it does not go higher upward than to about 2700 m., whence it is replaced by *P. erythrocephala* (Ludlow and Kinnear, 1937). In Yunnan, G. Forrest collected birds in July between 2700 and 3300 m. (Rothschild, 1925 and 1926). On Mt. Victoria, Heinrich found it in corresponding altitudes at 2600 and 3300 m. (Stresemann and Heinrich, 1940). Finally, in the east Malayan mountains, it inhabits the zones between about 1400 and 2100 m. on Mt. Tahan, in Pahang (Robinson, 1928).

Its notes are described as quite unlike those of the other bullfinches (Ludlow and Kinnear, 1937; Stresemann and Heinrich, 1940).

Material examined.—2 ♂♂, 2 ♀♀: Nepal, Darjeeling, Sikkim (Dublin Mus.; Leiden Mus.).

Pyrrhula leucogenys Grant

Characters.—Glossy black mask; tail forked; upper and under parts brown, without any lipochromous pigmentation in the male; a dark dorsal patch bordering the white rump; ear coverts almost

white; sexes alike in coloration, except for the outer web of the innermost secondary, which is deep red in the male and yellow in the female.

Subspecific variation.—The following races have been described: *P. l. leucogenys* Grant 1895: Lepanto, northern Luzon, Philippines; *P. l. steerei* Mearns 1909: northwest Mindanao. Mearns proposed this subspecific separation on the basis of a small difference in wing length, *steerei* being the smaller.

Range.—The province of Lepanto in northern Luzon, and the Malindang Mountains (Mt. Bliss) in northwest Mindanao.

Biotope.—"Mossy oak forest of mountains" (Delacour and Mayr, 1946:240). Mearns (1909) found it as high as about 1750 m. altitude.

Material examined.—1 ♂: northern Luzon (Leiden Mus.).

Pyrrhula erythaca Blyth

Characters.—Black mask, bordered posteriorly by a narrow white line; tail forked; in the male the throat is grayish, but the remaining under parts, except the lower abdomen and under tail coverts, are red. Upper parts gray, with an indistinct black dorsal band bordering the white rump anteriorly; in the female the under parts are buffish brown; head and neck are gray, but the interscapular region, scapulars, proximal wing coverts, and upper back are brown; a gray and black band borders the white rump anteriorly.

Subspecific variation.—The following races have been described: *P. e. erythaca* Blyth 1862: Sikkim; *P. e. altera* Rippon 1906: Shayang, Chutung Road, west Yunnan, southwest China; *P. e. wilderi* Riley 1918: Eastern Hills, 60 miles east of Pekin, Chihli, north China; *P. e. taipaishanensis* Rothschild 1921: Tsinling Mts., Shensi, north China; *P. e. owstoni* Hartert and Rothschild 1907: Mt. Arizan, Formosa (= *P. arizanica* Ogilvie-Grant 1912: same locality).

In the males the following racial characteristics have been noticed: (1) the intensity of lipochromous pigmentation of the under parts, which in eastern Himalayan birds is orange red, distinctly tinged with yellow, whereas in males from northern Burma and western China, including those from the Tsinling Mountains (Jacobi, 1923), the breast is brick red, usually without the slightest trace of yellow; male specimens from Chihli again have the breast distinctly tinged with yellow (Ludlow and Kinnear, 1944); in the Formosan race the red coloration is less developed and reduced to the sides of the breast (Ogilvie-Grant, 1912); (2) the intensity of the coloration of the upper parts, which is said to be darker in birds from northern Burma and western China than in those from the eastern Himalayas and from Chihli (La Touche, 1925); (3) the white band surrounding the black mask, which is widest in the Chinese birds, but almost absent in those from Formosa; (4) the reduction of the light gray of chin and upper throat in favor of the red of the under parts, which is most obvious in Chinese birds.

As regards the females, specimens from northern Burma and western China are said to be darker and browner than Himalayan ones. This is also noticed in females from the Tsinling Mountains (Jacobi, 1923) and from Formosa (Ogilvie-Grant, 1912). Females from Kansu are said to be lighter than those from Yunnan, whereas the type (♀) of *wilderi* (Pekin) is somewhat darker (Riley, 1926 and 1930). The restriction of the facial mask in females from the Tsinling Mountains and from Chihli is an additional character of these races.

Finally there is a small variation in size.

From these remarks it appears that geographical variation in this species is mainly quantitative and clinal. Consequently, the ill-defined borders of the races are of no importance to this study.

Range.—Mountains of western China, from northern Kansu (Stresemann, *et al.*, 1937) and Tsinling Mountains, through Szechuan and extreme southwest Tibet (Schäfer, 1938), northwest Yunnan (Rothschild, 1926) and the Adung Valley and Myitkyina District of northern Burma (Stanford and Mayr, 1940) to Bhutan and Sikkim (Meinertzhagen, 1927). In the last named regions it overlaps the range of *erythrocephala*, though *erythaca* is very rare west of 92° east latitude (Ludlow and Kinnear, 1944). Also, *erythaca* occurs on Mt. Arizan, Formosa (Kuroda, 1935). It is a rare winter visitor on the eastern Tombs near Pekin (La Touche, 1925), but the breeding locality of these winter birds is unknown. In suitable localities in eastern Bhutan, Ludlow found it rather common (Ludlow and Kinnear, 1944).

Biotope.—High mountain forests, chiefly of coniferous and mixed types. It has been found in forests of pine (northwest Yunnan: Rothschild, 1921), and spruce and fir (northwest Yunnan: Greenway, 1933), also in mixed forests (southern Tatung Mts., Kansu: Stresemann, 1937; northwest Yunnan: Greenway, 1933), consisting of conifers and rhododendrons (Yunnan: Greenway, 1933; Bhutan: Ludlow and Kinnear, 1944), as also in deciduous growths along mountain slopes, bordering river valleys (Hsifan Mts., western Szechuan: Schäfer, 1938). It has been observed repeatedly to eat the buds of willows, poplars, and birches, as well as their seeds and catkins (Stanford and Mayr, 1940; Ludlow and Kinnear, 1944). Like *erythrocephala* it is a high mountain bird which is mainly found above 3000 m. altitude, as indicated by the following records:

Western Kansu (Min-shan) in May and July, 2700-3000 m. (Lönnberg, 1924); Szechuan (Hsifan Mts.) even in winter, with a temperature of —20°C., up to 3600 m. (Schäfer, 1938); northwest Yunnan (Likiang Range) in summer between 3600 and 4500 m. (Greenway, 1933); northern Burma (Adung Valley) in June and July at 3600 m. (Stanford and Ticehurst, 1938); eastern Bhutan, nesting at 3000 m. (Ludlow and Kinnear, 1944); Sikkim, in January at 3250 m. (Meinertzhagen, 1927); Formosa (Mt. Arizan), between 2100 and 2400 m. (Ogilvie-Grant, 1912); Szechuan, in winter down to 760-1500 m. (Jacobi, 1923).

Various observers in all parts of the range have noticed the resemblance of the call-note of *P. erythaca* to that of both *P. erythrocephala* and *P. pyrrhula* (Ogilvie-Grant, 1912; Schäfer, 1938; Stanford and Mayr, 1940; Ludlow and Kinnear, 1944).

Material examined.—1 ♂, 2 ♀♀; Tai-pai-shan, Tsinling Mountains; Likiang District, Yunnan (Leiden Mus.; coll. Sillem-Van Marle).

Pyrrhula erythrocephala Vigors

Characters.—Black mask; tail forked; in the male the head and lower neck, as well as the under parts are orange buff, except the lower abdomen and under tail coverts which are white; sides of the head and upper throat are only very slightly tinged with orange; a narrow gray line bordering the black forehead; remainder of upper parts gray; in the female, under parts and a band posteriorly to the black forehead are pale drab gray; posterior part of crown and the hind neck are golden olive; remainder of upper parts, brownish gray.

Subspecific variation.—Although it is stated by Stuart Baker (1926:111) that eastern birds tend to have more saturated colors, there appears to be "so much individual variation and so much overlapping" that no races have been described.

Range.—Himalayas, from southern Kashmir and Kangra District, Punjab (Whistler, 1926) to Mt. Yönpu La, in extreme eastern Bhutan (Ludlow and Kinnear, 1944), where it meets the range of *P. erythaca.*

Biotope.—High mountain forests, chiefly of conifers. In summer it seems to prefer deep forests of pine, cedar, deodar, juniper, and fir, or mixed forests of fir, birch, and willow (*cf.* Stuart Baker, 1934); in winter it has been found in lower altitudes, frequenting oak and rhododendron forest (Kangra District: Whistler, 1926) and willows along streams (Simla: Jones, 1919). According to Meinertzhagen (1927) it is the commonest bullfinch throughout the Himalayas. Its vertical distribution indicates a high mountain bird. The first Mt. Everest expedition found it in the breeding season (Aug. 17) as high as about 3800 m. altitude (Kinnear, 1922), whereas a nest has been found in Kumaon at about 3600 m. altitude (Baker, 1934), but it seems also to nest on Mt. Yönpu La, eastern Bhutan, which is not higher than about 2600 m. (Ludlow and Kinnear, 1944). From November to January, Meinertzhagen (1927) found it in Sikkim between about 2700 and 3900 m. altitude, but it is also known to descend in winter down to 1100 m. (Stuart Baker, 1926).

Meinertzhagen (1927:383) states that its "plaintive whistle seemed much the same as that of our British bird" (*P. pyrrhula*).

Material examined.—5 ♂♂, 5 ♀♀: northwest Himalayas; Nepal; Darjeeling (Amsterdam Mus.; Leiden Mus.).

Pyrrhula aurantiaca Gould

Characters.—Black mask; tail forked; male approaching that of *erythrocephala,* but entire upper parts, including lesser wing coverts, orange buff. Under parts of the same coloration, but generally lighter; female resembling that of *erythaca,* but the under parts are tinged with pale orange rufous

or dull yellow and the upper parts are washed with yellowish brown; no white line bordering the black mask posteriorly.

No subspecific variation occurs.

Range.—Kashmir; westward apparently to Gilgit (Biddulph, 1881) and Chitral; also recorded as a breeding bird from Rawal Pindi District (Whistler, 1930); although frequently observed (Stuart Baker, 1926), not yet found as a breeding bird in Simla States and Garhwal.

Biotope.—Its partiality to dense coniferous forests has been noticed by several observers. Nests have been found at about 3700 and 3000 m. altitude (Stuart Baker, 1934) in forests of silver fir and birch with luxurious undergrowth. In winter it has been found as low as about 1700 m. altitude (*loc. cit.*). The species seems to be rather locally distributed.

Material examined.—None; see color plate in Gould, 1858.

Distribution and ecology.—The Himalayas are inhabited by four species of *Pyrrhula*, three of which are known to occur side by side in the Chinese-Burmese section, *nipalensis*, *erythaca*, and *erythrocephala*.

The westernmost representative is *P. aurantiaca*. According to its range it is confined to Kashmir and apparently has not been recorded as a breeding bird from any locality where *P. erythrocephala* breeds, although the latter species nests in Kashmir as well. Biotope (chiefly coniferous forests) and vertical distribution (from 3000 m. upward) are the same in *aurantiaca* and *erythrocephala*.

A considerable overlap of the ranges of *P. erythrocephala* and *erythaca* occurs in the eastern Himalayas. The joint range extends from Sikkim to eastern Bhutan, where the two species nest in the same biotope of chiefly coniferous forests above 2500-3000 m. altitude. Although Ludlow met with the two species in the same localities, *erythrocephala* is just as rare east of latitude 92°E. (mid-Bhutan) as is *erythaca* west of this line (Ludlow and Kinnear, 1944). Thus, one might conclude that interspecific competition acts as a factor preventing further overlap of the respective ranges.

The Himalayan range of the fourth representative (*P. nipalensis*) covers the region inhabited by *aurantiaca* in the West, *erythrocephala* in the middle and *erythaca* in the East. Yet, most observers record *nipalensis* from broad-leaved and mixed forests rather than from a coniferous type of forest. Consequently there is a difference between the other species and *nipalensis* in altitudinal distribution, since the latter occurs usually below 3000 m. altitude. Furthermore, its occurrence in the mountain forests of Yunnan and Formosa side by side with *erythaca* indicates that there is no essential interspecific competition between *nipalensis* and the *erythaca-erythrocephala-aurantiaca* group, in relation to which *nipalensis* acts as a sympatric species.

Since the three species *erythaca*, *erythrocephala*, and *aurantiaca* have close ecological similarities, in contrast to *nipalensis*, it might be of interest to point out that according to several observers, the call-note of the high-mountain group is the same among the three species and closely resembles that of the familiar western European *P. pyrrhula*, whereas the call-note of *P. nipalensis* is described to be rather harsh and remarkably different from the sweet whistle of the other bullfinches.

None of the Oriental and Himalayan bullfinches is migratory, although there are several records of their moving vertically with the season.

Character geography.—Three species of *Pyrrhula* from southeastern Asia have black forehead, lores, and chin in both sexes (*erythaca, erythrocephala, aurantiaca*). I have shown above that these black-masked forms are ecologically alike and that there is a tendency for them to replace each other geographically. Furthermore, in the males of these species there is a tendency toward increase of orange-red pigmentation from east to west: *erythaca*, orange-red breast and flanks; *erythrocephala*, orange-red head and hind neck, throat, breast, and flanks; *aurantiaca*, orange-red back, scapulars, hind neck, head, throat, breast, and flanks.

On account of their linked ranges and the similarity of their color pattern, in addition to a quantitative difference in pigmentation, these forms are here considered as three elements of one interspecies (Ripley, 1945), which will be called the *erythaca* interspecies, "Masked Bullfinch." The tendency toward extension of the red pigmentation of the under parts to the feathers of the upper parts is also found in the males of other species (*P. pyrrhula*), which coincidentally may have brick-red edgings to the feathers of mantle and back.

The adult of *P. nipalensis* is different from those of all other species of *Pyrrhula* in having no black whatever on the head, except that in the race of eastern China, the crown is more strongly indicated because of the dark brown centers of the crown feathers. This brown plumage is remarkable, since it is reminiscent of the juvenal plumage of apparently all species of *Pyrrhula*. The white shaft streaks in the central tail feathers of the Formosan *P. n. uchidai* are without antecedents in the genus, although white patches on the inner web of the lateral tail feathers can be observed frequently in *P. pyrrhula*, especially in the race *cassini*.

The adult Philippine *P. leucogenys* has a black cap and chin, resembling the Palearctic species. The black feathers, however, have a much stronger metallic gloss than in the latter. The white cheeks and ear coverts of *leucogenys* are a rare character in the genus *Pyrrhula*, but it is approached in eastern Malaya by *P. nipalensis waterstradti*, which also has white on sides of the head.

The Oriental and Himalayan species of *Pyrrhula* form a taxonomic unit by possessing a distinctly forked tail and normally developed upper tail coverts. In the Palearctic species the tail is almost square and the upper tail coverts are markedly long. The species are of approximately the same size; *P. nipalensis* is slightly larger than the others. In addition, *P. nipalensis* and *P. leucogenys* have in common a relatively long tail, as indicated by the following measurements of males only:

	Wing	Tail	
P. n. nipalensis	85-90 mm.	73-77 mm.	(Stuart Baker, 1926)
P. e. erythaca	82-84	67-69	"
P. erythrocephala	76-79	60-64	"
P. aurantiaca	80-83	57-58	"
P. l. leucogenys	79	77	(Leiden Museum)

On the basis of the characters just discussed, *P. nipalensis, leucogenys, erythaca, erythrocephala,* and *aurantiaca* have been united into one subgenus, *Protopyrrhula* (Bianchi, 1906), which, however, has no nomenclatural value.

The eggs of *nipalensis, erythaca,* and *erythrocephala* are said to resemble those of *Chloris* and *Loxia* in having a pale greenish white ground color with reddish brown markings, which are most conspicuous in forming an ill-defined ring near the broad end. Those of *aurantiaca* differ in having a white ground color without green tinge (Stuart Baker, 1934; Schönwetter, 1929). Those of *leucogenys* are not known. Since the eggs of the Palearctic species have a bluish ground color, the above remarks once more show that the Himalayan and Oriental bullfinches are closely linked together.

History.—Although there are no indications as to the events that have led to the separation between *P. nipalensis* and the masked bullfinches, yet it seems clear that ecological divergences played an important, if not exclusive, role. This conclusion is the more pressing, since *P. nipalensis* shares its range with all three species of masked bullfinches, including *P. e. owstoni* on the island of Formosa. The highly disjunctive range of *P. nipalensis* and its penetration or retreat into isolated subtropical or tropical mountains (Chin Hills; eastern Malaya) justify the conclusion that the specific sepa-

ration between the Brown-headed (*nipalensis*) and the masked bullfinches is of considerable age. The fact that all juvenal bullfinches have a brown head and a uniform brown dress without the red or orange red coloration of the adult males of many widespread species furnishes clear evidence in favor of the assumption that the original bullfinches were uniform brown birds, although with the characteristic black wings and tail and the white rump. The juveniles of at least the European species *P. pyrrhula* have horny yellowish bills, instead of black ones, thus curiously reminding one of the adult of *P. nipalensis*. In conclusion, *P. nipalensis* might be regarded to represent or to resemble most closely the original type of bullfinch from which all other bullfinches have been derived. This form seems to have been but little altered during the long time that has elapsed since the branching off of the *erythaca* interspecies. Its disjunct distribution, however, indicates periods when extermination occurred over large areas.

The generally brown plumage, the isolated tropical range and the mountainous habitat of *P. leucogenys* link it with *P. nipalensis*, although the head coloration of *leucogenys* is quite distinct. The black crown, however, is indicated in the Fukien race *P. n. rickettii*, and the white sides of the head are found in *P. n. waterstradti* of Malaya. Furthermore, *P. nipalensis* and *P. leucogenys* are the only representatives of the genus having the bill yellowish horn with dark culminal ridge and tip, instead of being wholly black, although in *P. n. waterstradti* the base of the bill is leaden color and not horn. The secondary sexual difference in the lipochromous pigmentation of the outer web of the innermost secondary is also the same in both species (red in male, yellow in female). Consequently, there is sufficient evidence in favor of the supposition that *P. leucogenys* is an old sidebranch of the *Pyrrhula* stock, more closely related to *P. nipalensis* than to the *erythaca* interspecies. In fact, it might be regarded to be a derivative of *P. nipalensis*, with which it should be united in one superspecies.

The disjunct distribution of *P. erythaca* in eastern China (Eastern Tombs; Formosa) without conspicuous geographical variation reveals the fact that *P. erythaca* must be the older form of the *erythaca* interspecies. Its distribution might be an indication of the Chinese origin of the whole interspecies. The considerable destruction of the forests in most parts of China by human agency may be the cause of the extermination and of the retreat of *P. erythaca* in the mountain forests of western and northern China. Its extermination near the Eastern Tombs (Chihli) was evidently caused by recent deforestation of the country (La Touche, 1925; Bangs, 1932).

The Kashmir representative (*aurantiaca*) has not a single relation with any of the black-headed palearctic forms. On the contrary, it shows clear structural, ecological, and distributional affinities with the Himalayan *P. erythrocephala*, the latter in turn resembling *P. erythaca* of western China. The fact that *aurantiaca* exhibits the most extreme color type of all southern Asiatic bullfinches and possesses the most reduced blue pigmentation (ground color) on its egg shells is in accordance with its extreme western range which is situated at the distributional end of a continuous chain of populations. The divergence between *P. erythaca* and *P. aurantiaca* in coloration and range is perfectly linked by *P. erythrocephala* of the Himalayas. Therefore, the species *erythrocephala* and *aurantiaca* are here considered invaders into the Himalayas from southwestern China.

Unfortunately, the recent distribution of the masked bullfinches does not elucidate the question as to how they diverged originally. Nevertheless, each species has a clear center of dispersal, which, I think, may be located as follows: *erythaca*, mountains of southwestern China; *erythrocephala*, central Himalayas; *aurantiaca*, Kashmir.

THE EASTERN PALEARCTIC BULLFINCHES

Pyrrhula griseiventris Lafresnaye

Characters and subspecific variation.—See general discussion beyond.

The following races may be recognizable: *P. g. griseiventris* Lafresnaye 1841: Japan; *P. g. cineracea* Cabanis 1872: Lake Baical (= *cassini* of former authors; see Swarth, 1928); and *P. g. kurilensis* Sharpe 1886: Kurile Islands.

Range.—Northern Japan, on Hondo, Seven Islands of Izu (Hachisuka, *et al.*, 1932), Jesso, but absent in the islands of Shikoku and Kiushiu (Jahn, 1942), southern and middle Kurile Islands, north to Ushishiru (Yamashina, 1931) and Sakhalin (Lönnberg, 1908); Amur region (Worobiev, 1937), Manchuria and Korea (Dementiev, 1934), once in Tsu-shima in Strait of Korea (breeding ?: Kuroda, 1922), Greater Khingan Mts., west to Transbaicalia (Upper Amur River) and the Kentei (Kozlova, 1933) and Khangai Mts., also Baicalia (Stegmann, 1936), Sajan Mts. and northeast Altai. Nests have been found as far west as Tomsk (Johansen, 1944), and apparently Minussinsk (Sushkin, 1925), whereas Johansen (*loc. cit.*) mentions a summer record from Beresow on the Lower Obj River. In winter it has been found in China, south to Shanghai (very rare: La Touche, 1925), rather frequently in southwest Siberia and exceptionally in southeast European Russia (Orenburg: Suschkin, 1914). The Greater and Lesser Khingan Mts. probably form the boundary between the races *griseiventris* and *cineracea*, but the latter has been found in winter within the range of *griseiventris* (Amur Region: Stegmann, 1931).

Biotope.—See general discussion beyond.

Material examined.—3 ♂♂, 1 ♀: Lake Baical; Onon River; Upper Yenissei River. 13 ♂♂, 6 ♀♀: Japan (Amsterdam Mus.; Leiden Mus.; coll. Sillem-Van Marle).

Pyrrhula pyrrhula (Linnaeus)

Characters and subspecific variation.—See general discussion beyond.

The following races may be recognizable: *P. p. pyrrhula* (Linnaeus 1758: Sweden); *P. p. cassini* Baird 1859: Nulato, Alaska (= *kamtschatica* of former authors; see Swarth, 1928); and *P. p. jenisseiensis* Johansen 1944: Krassnojarsk, Upper Yenissei.

Range.—The taiga zone of Siberia, north to the southern Yamal Peninsula (Stschutschja, according to Schuchow, *fide* Johansen, 1944), south generally to 57° N. lat. (Tomsk; Krassnojarsk: Johansen, 1944); the Sajan Mountains, northern Altai (Johansen, 1944) and Baicalia (Kozlova, 1933), to the coast of the Okhotsk Sea, south to Ajan (Dementiev, 1934); also Kamchatka and the northern Kurile Islands (Paramushiru: Yamashina, 1931). Accidentally in the Commander Islands [♂, Bering Island; ♀, Copper Island: June-July (!): Hartert, 1920], St. Lawrence Island [♂, May (!), 1936: Friedmann, 1937] and Nunivak Island (Swarth, 1928), in the Bering Sea; also northwest Alaska (Nulato: Swarth, 1928). Outside the breeding season it has been observed in more southern countries: northern Persia (rare: Sarudny, 1911), Turkestan and Tarbagatai (Dementiev, 1934), Transbaicalia, Ussuri Region (Stegmann, 1931; Kozlova, 1933), northeast Korea (Meise, 1934), northern China (Eastern Tombs, Chihli: La Touche, 1925), and in Sakhalin (Hesse, 1915) and Japan (Hondo: Dementiev, 1934; also one ♀ from "Japan" in the Leiden Museum). The race *cassini* occupies the region east of the mountains of Werkhojansk and Stanovoi, whereas the typical race has been found to the west of it, as far eastward as Yakutia and the Aldan-Maja rivers region (Johansen, 1944). Nevertheless, the species appears to be absent as a breeding bird in the Yakutia region itself, as also in the mountains of Werkhojansk (Tugarinov and Buturlin, 1925).

Biotope.—See general discussion below.

Material examined.—3 ♂♂, 3♀♀: Japan; Onon River; Tomsk; Askabad, Transcaspia (Leiden Mus.; coll. Sillem-Van Marle).

Distribution and ecology.—The eastern form, *P. g. cineracea*, has been found nesting within the breeding range of *P. pyrrhula* in the following localities: Kentei and Khangai regions, Baicalia, Sajan Mts., and northern Altai, northwards and westwards to the River Obj (Tomsk) (Sushkin, 1925; Stegmann, 1931; Kozlova, 1933; Grote, 1936; Johansen, 1944). Johansen (1944) mentions summer records as far west as Beresow on the Lower Obj. In the eastern portions of this joint range (Kentei, Khan-

gai) *P. g. cineracea* is by far the commoner of the two, but near Tomsk the situation is just the reverse, *cineracea* being much rarer than *pyrrhula*. In the above countries the two forms have been found according to Sushkin (1925:14) "in the same locality, sometimes one species within some hundred yards from the other, in the same habitat and on the same level." Johansen (1944) found them breeding in the dark taiga of *Picea* and *Abies*, interspersed with birch and poplar. Forests of pure pine near Tomsk are inhabited by *pyrrhula* only, whereas in the eastern Kentei Mountains *pyrrhula* and *cineracea* have been found in bushes and trees near river valleys and in the lower zones of the mixed forest. In the latter countries, however, the higher zones of pine, cedar and larch woods are said to be inhabited by *cineracea* only (Kozlova, 1933). Although there is a considerable overlap in the ranges of *P. g. cineracea* and *P. p. pyrrhula*, yet there appears to be some interspecific competition, resulting in the fact that *cineracea* is much rarer in the West, and *pyrrhula* in the East, whereas the less favorable pure conifer forests are inhabited by the latter species only, which is evidently more eurytopic than *cineracea*. Interspecific competition may be diminished because the forest types preferred are slightly distinct (Johansen, letter, 1948), and that, at all events near Tomsk, the breeding time of *cineracea* starts a few weeks later than that of *pyrrhula* (Johansen, 1944): *pyrrhula*, full clutches between May 9 and June 27; *cineracea*, full clutches between June 1 and July 9. The relatively late breeding season of *cineracea* links it with the Oriental and Himalayan bullfinches, which are also extraordinarily late breeders.

Character geography.—All Palearctic bullfinches have a black facial mask and cap (fig. 7). They have only very slightly forked tails and very long upper tail coverts. Consequently, they are here considered to represent the typical subgenus *Pyrrhula*, the "black-capped bullfinches." As compared with *P. griseiventris*, the males of *P. pyrrhula* show a large amount of red pigmentation on the sides of the head and the under parts, which characters remain constant throughout the whole range of the species from Kamchatka to western Europe. Nevertheless, males from Kamchatka (*cassini*) have the upper parts of a more clear gray tone and are on the average smaller than those from central Siberia (*pyrrhula*). In *cassini* the wing of the males measures up to 96 mm., as against 100 mm. in Yukatia males (Johansen, 1944). The white streak on the inner web of the lateral rectrices is much more frequently found in *cassini* than in any other race of *P. pyrrhula*.

P. griseiventris is much less constant in its coloration. In Japanese and Manchurian males (race *griseiventris*), the sides of the head are more or less red. The under parts are more variably and slightly red, but in many specimens these are pure gray, without any tinge of red. In the Kuriles a light gray race occurs (*kurilensis*) in which the under side of the males may have only a slight tinge of rosy. West of the Khingan Mountains the species has lost even the slightest trace of red pigmentation, the males being gray, black, and white only (*cineracea*).

Those males of *P. g. griseiventris* showing strongly tinged under parts may be adult birds exclusively, since all three immature specimens, as defined by the wing characteristics given by Drost (1940) and Mayaud (1944) for European birds, have the under parts mostly gray, with only the cheeks and ear coverts dark red.

Several specimens intermediate between *P. p. pyrrhula* and *P. g. cineracea* have been collected in the common breeding ranges. Stegmann (1931) mentions three adult males taken during the winter in southern Baicalia, Khangai and northern Altai. According to Johansen (1944), intermediate birds have been observed frequently near Tomsk, also. These intermediate males resemble the race *griseiventris* (Stegmann, 1931; Johansen, 1944), but by most authors they have been interpreted as hybrids between *pyr-*

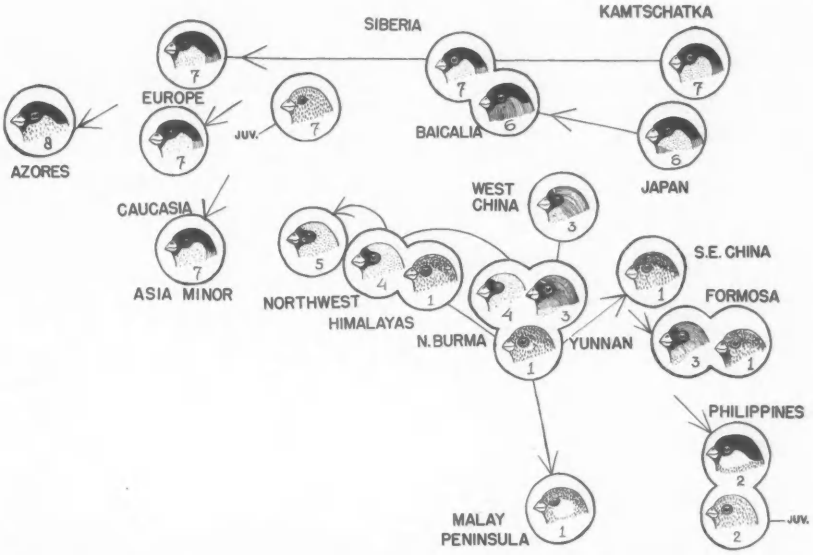

Fig. 7. Diagram of the character geography, not phylogeny, of the genus *Pyrrhula*. Plumage colors other than black are indicated as follows: dots, red; parallel straight lines, gray; wavy lines, brown. The various species are numbered as follows: 1, *nipalensis*; 2, *leucogenys*; 3, *erythaca*; 4, *erythrocephala*; 5, *aurantiaca*; 6, *griseiventris*; 7, *pyrrhula*; 8, *murina*. When circles overlap, the species occur sympatrically.

rhula and *cineracea*, although there does not seem to be any convincing evidence of a wild cross between these species. According to Sushkin (1925), the intermediate birds are not hybrids at all, but they exhibit the normal range of variation of the subspecies *cineracea*. A rather wide range of variation within *P. g. cineracea* is in accordance with the fact that in the males of *P. p. pyrrhula* from central Siberia, Johansen (1944) found a slight, but distinct tendency toward variation in the direction of *P. cineracea*, the under side showing a soft raspberry red coloration as in *griseiventris*, rather than the brick red coloration of *pyrrhula*. Consequently, this race *jenisseiensis* (Johansen, 1944), which is based upon winter birds from the Upper Yenissei River (Krassnojarsk), is claimed to represent a transition between *pyrrhula* and *cineracea*, although strongly tending towards *pyrrhula*. However, the parallel action of climate to reduce the red pigmentation may account for the similarity. At all events, the racial characteristics of *P. p. jenisseiensis* seem to be very poorly defined. The only male from Tomsk examined by me (December) closely resembles a series of Scandinavian males, although its under parts are of a slightly clearer vermilion.

Taxonomic distinctness of *P. p. pyrrhula* and *P. g. cineracea* is further indicated by the fact that *pyrrhula* has larger dimensions and a heavily swollen bill, whereas *cineracea* is smaller and has a slender bill like that of the western European birds. According to Sushkin (1925), the few intermediate ("hybrid") specimens have the shape of bill of *P. g. griseiventris*!

There does not seem to be any reason for the assumption (Johansen, 1944) that the race *griseiventris* represents a hybrid population between the forms *cineracea* and *cassini*.

It does not seem to be known if the breeding range of *P. g. griseiventris* is geographically connected with that of *P. pyrrhula*.

History.—Contrary to the commonly held opinion, recent Russian geologists (Wojeikow, Obrutschew) have found convincing evidence of the occurrence of considerable Pleistocene glaciations in western Siberia and in northern Altai (see the short summary by Johansen, 1943), the intensity of which gradually decreased eastward. In the Altai region, the remnants of three or four glaciation optima have been traced. Nevertheless, there does not seem to be any argument in favor of the extreme view of Reinig (1937), who stated that no Pleistocene taiga refugium in Siberia could have existed. In the case of *Dendrocopos m. major*, I have tried to show that this race must have survived during the last glacial period in local southern Siberian forests which were isolated from both the Manchurian and the Turkestan region (Voous, 1947). The same applies to *P. p. pyrrhula* of Siberia, which, in an unbroken chain of very similar populations, inhabits the northern Asiatic taiga from Kamchatka to the Ural Mountains.

The slight difference in coloration and dimensions between the Kamchatkan and the central Siberian bullfinches is noteworthy. In this respect the distribution of *Dendrocopos major* in eastern Asia should be compared. A conspicuous similarity in the ranges of *P. pyrrhula* and *D. major* is the existence of distinct Kamchatkan races, as well as the fact that the mountains of Werkhojansk and western Stanovoi form the racial boundary. The main difference in the ranges of *P. pyrrhula* and *D. major* is the fact that in the case of *Pyrrhula*, Kamchatka is inhabited by populations closely resembling the Siberian ones and sharply distinct from those of Manchuria, whereas in *D. major* the Kamchatkan race is much closer to that of Manchuria than to that of Siberia. In conclusion it is clear that, at least during the last great Asiatic glaciation, there were three separate refugia inhabited by forest birds: Manchuria, Kamchatka, and central southern Siberia.

Southeast Transbaicalia, which is inhabited by the plain gray *P. g. cineracea*, is known as a glacial refugium of forests or parklands and might therefore be considered to represent the recent center of dispersal of this form. It is also considered by Eller to be the center of dispersal (and consequently a glacial refugium) of a section of the butterfly species-group *Papilio machaon* (Pagast, 1939). The distributional relation between *cineracea* and *pyrrhula* indicates that during the last glaciation they inhabited separate regions. Postglacially they have infiltrated each other's ranges, probably with a certain amount of hybridization. It is known that the northern boundaries of the Mongolian deserts have been richly covered with forests, not only in postglacial times, but also before the last glaciation. As a result the Manchurian populations may have been able to spread into the regions north of the Gobi Desert either during the postglacial, the last interglacial, or an interstadial period. Of these populations, *cineracea* is here considered to represent the direct offspring. The difference between the races *griseiventris* and *cineracea* can be considered to be an argument in favor of the assumption that their genetic separation is older than the postglacial. At all events *cineracea* is taxonomically and historically closer to *griseiventris* than to *pyrrhula*. As *cineracea* and *pyrrhula* inhabit overlapping ranges, they must be treated in nomenclature as distinct species. *Griseiventris* should be incorporated into *cineracea*. Since the ranges of *P. griseiventris* and *P. pyrrhula* overlap with a marginal fringe of hybridization, these species should be called "emergent interspecies" (Ripley, 1945).

The exclusive occurrence of the race *griseiventris* in Manchuria and Japan, which were forest refugia during the Pleistocene glacial periods, reveals the fact that during at least the last great glaciation in northern Asia, these refugia were inhabited by populations resembling the present race. The conspicuous variability within the race *grisei-*

ventris is comparable to the variability which seems to be present, for example, in the Manchurian form *Garrulus g. bambergi* (Voous, 1945). This phenomenon might have some historical cause, although there are no indications that the variability originated in the postglacial. Nevertheless, Manchuria acts as a kind of "allele-center," at all events in *Pyrrhula* and *Garrulus*. As in such cases as *Garrulus glandarius, Dendrocopos major, D. leucotos,* and *D. minor,* the Manchurian populations of *Pyrrhula* represent the stock from which Siberian populations have originated postglacially. From these also the race *P. g. cineracea* arose in postglacial times by losing even the last trace of the red pigmentation still found in the race *P. g. griseiventris*.

A slight similarity exists between *P. g. cineracea* and *P. murina* from the Azores, caused by the absence of any red pigmentation in the male sex. Nevertheless, it appears from the above remarks that there is no basis for the assumption that they are genetically closely related or that their ranges have been once geographically connected. Consequently, I cannot follow Görnitz (1923), who considered *cineracea* and *murina* as the oldest (relict) forms of the genus *Pyrrhula* and who compared them with the geographically disjunct races of *Cyanopica cyanea* of southeast Asia and the Iberian Peninsula.

A zoögeographical element which is probably comparable with *P. g. cineracea* is found in *Dendrocopos major mongolus*. This much disputed race inhabits northern Mongolia and the Kentei Mountains and is said to be intermediate between the Manchurian race *tscherskii* and the Siberian race *major* (= "*brevirostris*"), although sufficiently distinct from both to represent a separate race (see Voous, 1947:18 and 22). The Manchurian-like jays (*G. g. bambergi*) from the eastern Tian Shan Mountains (Voous, 1945) probably also belong to this group of remnants of the old northern Mongolian forest fauna, provided that our specimens of jays did not represent migrants from northern regions!

No taxonomic or distributional fact is known to the author which might serve to clear up the relationship between the Palearctic black-capped bullfinches and the Chinese masked bullfinches. Although it is possible that *P. erythaca* may be extending its range northward into extreme southern Manchuria (see Meise, 1934), no distributional contact between these two groups of bullfinches is known. Nevertheless the resemblance between the juveniles of the Black-capped Bullfinches and the adults of *P. nipalensis,* and the close taxonomic similarity between, for example, the female of *P. leucogenys* from the Philippines and the female of *P. griseiventris* from Japan and especially from the Kurile Islands (Ogilvie-Grant, 1895) may be considered to be a strong argument in favor of the view that the Palearctic bullfinches have spread from an Oriental center. However, the distributional gap and the close relationship of *P. leucogenys* with *P. nipalensis* indicate that the black cap of the Philippine species and the black cap found in the subgenus *Pyrrhula* have probably arisen independently. I can find no indication as to whether or not the subgenus *Pyrrhula* is the direct offspring of *P. erythaca* or of *P. nipalensis*. The black facial mask and the red under parts of the *erythaca* interspecies, in contrast to *nipalensis,* which is plain brown, might be an argument in favor of *P. erythaca*.

From the fact that the black-headed bullfinches are absent as breeding birds in southern Japan (Shikoku; Kiushiu; Riu Kiu Islands) one may conclude that their present range has been occupied only recently. The peculiar jay, *Garrulus lidthi,* from Amami-oshima and Tokunoshima, Riu Kiu Islands, for example, belongs to a much older group of forest birds, with different representatives in the Caucasian and Hyrcanian regions, as well as in northern Africa. Bullfinches do not occur in northern Africa, and their Caucasian and Hyrcanian races are only slightly differentiated. These facts uphold

the assumption of a relatively recent history for Palearctic members of the genus *Pyrrhula*.

THE WESTERN PALEARCTIC BULLFINCHES

Pyrrhula pyrrhula (Linnaeus)

Characters.—Glossy black cap and black chin in both sexes; under parts of males rosy red, upper parts, gray; upper and under parts of females brownish, the upper surface generally more olive than the under parts, which are tinged brownish purple; innermost secondary of males has a gray outer web, part of which may be more or less strongly tinged with red. The latter condition was found in adult birds as defined by Drost (1940) and Mayaud (1944), although odd adult birds have the outer web pure gray and odd juvenal birds may have it red. In most adult females the outer web of the same feather is strongly tinged with drab brown. The plumage of the juvenal birds, which is plain brown, has been discussed in the chapter on the history of the Oriental species.

Subspecific variation.—In spite of the large area inhabited, subspecific variation is slight. British and Dutch males have the under parts less bright vermilion than all other European males examined. In Caucasian males (*rossikowi*), especially in South Caspian ones (*caspica*), the under parts are brighter and more orange, less pink, than in any other form of *P. pyrrhula*. The upper parts of the Dutch and British males are of a darker shade of gray than found in the other European males. They are darkest in Scottish mountain birds (*wardlawi*, see Clancey, 1948). The females of the same series have the under parts tinged with brown, although this is more clearly pronounced in British and particularly in Irish birds. In British females the upper parts are of a distinct dark olive brown tinge, although rather grayer in Scottish mountain birds (*loc. cit.*); they are brown in Dutch and German females and grayish brown, or even more gray, in northern European and Siberian birds. Scottish birds (*wardlawi*) have, on the average, smaller and less "massive" bills than other British birds (Clancey, 1947 and 1948). Finally, the white streak on the inner web of the outer tail feathers, which is most frequently found in birds from Kamchatka, is occasionally present in European birds, especially in those from Scandinavia and Russia.

Subspecific variation in size, however, is significant and well known (tables 1 and 2; fig. 8). Various races have long been recognized upon more or less sound bases, but their nomenclature is remarkably confounded (see Stresemann, 1919; Hartert and Steinbacher, 1932-1938; Mayaud, 1939). In establishing subspecific boundaries many errors have been made in the past by the use of non-breeding specimens. In the exhaustive paper of Stresemann (1919), only 44 of 363 listed specimens (12 per cent) were collected in the breeding season; and of 64 Dutch specimens examined in this study, only 10 were more or less certain breeding specimens (16 per cent). Breeding birds, as recognized here, must have been taken between April 8 and August 31. A few British and Dutch specimens considered to represent breeding birds, but taken between April 3 and 8, have been included.

The tables of wing measurements are based upon 186 breeding males and 78 breeding females. As indicated there, the measurements were taken by different workers, but the records have been compiled with the greatest possible care so as to make the measurements strictly comparable.

The tables and figure 8 reveal that the smallest bullfinches inhabit southwestern and western France (average wing of 79.0 mm. in males), a fact which has been recently claimed by Mayaud (1939). In a south-north cline the populations show increasingly larger average measurements, which in the rest of France, Great Britain, Ireland, and the Netherlands vary between 82 and 83 mm. Although the measurements in southwestern and central Germany seem to be generally slightly larger (males, 85.6), there seems to be a decided gap between those, for example, from Lower Franconia (males, 84.3; females, 84) and those from the southern German mountain region (males, 89.4; females, 86.4), where an apparent breeding male is recorded with a wing of no less than 93 mm. (Stresemann, 1919). From those regions eastward, the average measurements increase from 90.0 in males from Bohemia, through 90.4 in the High Tatra Mountains, to 91.3 in the eastern Carpathian Mountains (see Cerny, 1938). One female from the High Tatra Mountains even measures 95 mm. (*loc. cit.*). An increase in average dimensions can also be noticed from France to the Swiss Jura and the Alps. A breeding male taken in the vicinity of Geneva has a wing of 85 mm. and four additional males collected in the same region outside the breeding season measure 82, 85.5, 85.5, 86.5 mm. (Dottrens, letter, 1948), whereas the average measurement of six alpine males has been found to be somewhat more

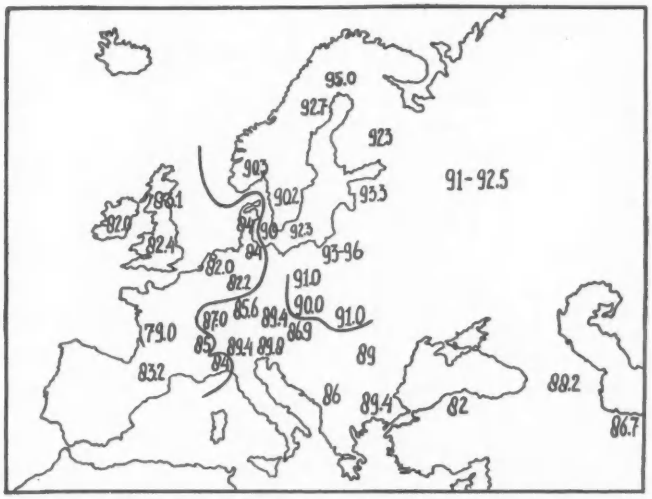

Fig. 8. Geographic variation in average wing length of breeding populations of *Pyrrhula pyrrhula* in Europe.

than 90.0 mm.; intermediate measurements occur in the intermediate areas (see tables). Breeding males from the Vosges (87.0) appear to be larger than those from the neighboring regions of France (Meurthe-et-Moselle: 83.5), a fact to which Hartert (1903) has already called attention. Breeding birds from Spain are not mentioned in the literature, although Ticehurst and Whistler (1928) record the wing measurements of seven males as 80-84 mm. and those of four females as 77.5-80.0 mm. Breeding specimens are absent in the Madrid Museum, but the few Spanish bullfinches that are present measure 80, 81, 81, and 85 mm. in males, 79 and 81 mm. in females (Galiano, letter, 1947). In their smallness these Iberian birds agree with birds from southwestern France. Breeding birds from Italy are also practically absent in the three Italian museums to which inquiries were addressed (museums of Genoa, Milan and Turin). One breeding male from northwestern Italy (Piedmont) has a wing of 84 mm. agreeing with dimensions from western Europe. Random northwestern and mid-Italian specimens have corresponding measurements: males 82-88, average (10) 85.7; females, 82-88, average (5) 83.3 mm. Specimens with large dimensions agreeing with those of the Scandinavian ones have been frequently recorded in Italy, mostly in the Italian Alps (Arrigoni, 1929). In the Milan Museum is a breeding male from Bolzano, Venetian Alps, with a wing of 89 mm. This bird is larger than any western European breeding bird. In the same museum is a male from Zambla, Bergamasker Alps, with a wing of 90 mm. (Moltoni, letter, 1948).

Southeastern European birds (males, 89.4; females, 86.5) appear less regular in the table, although it is clear that they are considerably larger than western European birds, agreeing with those from southern Germany (males, 89.4; females, 86.4). Nevertheless, they are distinctly smaller than those from Scandinavia, with which they have been united by Stresemann (1919), who apparently was confused by the great number of wintering birds of large size. Additional Serbian birds collected outside the breeding season measure 87, 87, 89 in males, 86 and 88 mm. in females (British Museum, data from Macdonald, letter, 1948). The specimens from lower Austria are slightly smaller in males (86.9), although slightly larger in females (87.2); they are larger than specimens from any western European population, except those from the Vosges.

Decidedly larger bullfinches are found in the province of West Prussia, eastern Germany (males, 91.0; females, 89.6), from where the dimensions increase in an easterly direction. Comparably large measurements occur in breeding males from Zealand, Denmark (90). In Scandinavia the average measurements tend to increase from southern Sweden (males, 89.5; females, 88) and southeast Norway

(males, 90.3), northward to Lapland (males, 95.0; females, 90.0). These measurements apparently are the same as those found in Finland (males, 92.3; females, 90.3), central Russia (males, 91-92.5), and Siberia (males, 90-94.5), although Russian and Siberian birds are known with wing lengths up to 100 mm. Wings of Rumanian winter birds have been found to measure as follows: males, 92-97, average (8) 94.4; females, 90-92, average (3) 91.0 mm. (Sassi, letter, 1947; coll. Sillem-Van Marle). These specimens might be referred to northern migrants and not to breeding birds.

In conclusion, it appears that there are three series of populations, each independently showing a slight clinal variation in size. The origins of these series may be located in (1) southwest France and northwest Italy, (2) Yugoslavian and Bulgarian mountains, (3) Russia and northern Scandinavia. The differences in dimensions are more or less sharp and, therefore, can serve as racial characteristics. The birds from central Germany, the southern German mountains, the Vosges, and western Switzerland, as also those from the Carpathian Mountains, might be considered to belong to intermediate populations. These will be discussed in the section on the postglacial history of the species in Europe. Consequently, subspecific names applied to breeding birds from these localities are of doubtful value in nomenclature. It would be advantageous to declare these populations as indeterminate. Bullfinches from southern Germany (males, 89.4; females, 86.4) have apparently the same average wing measurements as southeast European birds (males, 89.4; females, 86.5), so that in order to avoid still more confusion in nomenclature, the name *germanica* (Brehm, 1831: "die deutschen gebirgigen Nadel- und Buchenwälder" = Renthendorf, Thuringia) should be considered to apply to the southern German and eastern European mountain populations, although it would seem to be more in keeping with the evidence to drop the name *germanica* in preference to another name that applies to a stable population instead of to a mixed one. The same situation exists in the use of the name *coccinea* (Gmelin, 1789: Karlsruhe, Baden, southwest Germany), the type locality of which is near the easternmost boundary of the small western European race, but, as *coccinea* has priority over the name *europaea* (Vieillot, 1816: Normandy; Brittany; Anjou; see Mayaud, 1939), it must be used for the western European race.

Apart from the mentioned mixed populations, the wing measurements of the three main groups of populations can be summarized as follows:

	Males			Females		
	Number of specimens	Range	Average	Number of specimens	Range	Average
W. Europe	59	77 -87	82.0	23	78-84.5	81.0
S. E. Europe	11	86 -92	89.1	2	86-87	86.5
N. and E. Europe	22	89.5-97	92.1	11	86-94	90.0

Although there is no question that the difference in dimensions between the Scandinavian and the western European birds justifies their racial separation, yet the Balkan birds are of intermediate size. However, from a zoögeographical point of view it seems advisable to place the latter birds under a separate subspecific name.

The dimensions of Transcaucasion birds agree with those of southeastern European mountain birds; they are of intermediate size (males, 88.2; females, 87.7 mm.). Measurements of Caucasian birds were not available. Southern Caspian (86.7) and Asia Minor males (82) seem to be slightly smaller. On account of a different tinge of the red under parts in the males, two races have been recognized.

The following names are considered to be the most suitable for the European races: *P. pyrrhula pyrrhula* (Linnaeus 1758: Upsala, Sweden); *P. pyrrhula germanica* Brehm 1831: Renthendorf, Thuringia (Stresemann, 1919); *P. pyrrhula coccinea* (Gmelin 1789: Karlsruhe, Baden, S.W. Germany); *P. pyrrhula nesa* Mathews and Iredale 1917: Tring, Hertfordshire, England; *P. pyrrhula wardlawi* Clancey 1947: Perthshire, Scotland; *P. pyrrhula rossikowi* Derjugin and Bianchi 1900: Caucasia and Transcaucasia; *P. pyrrhula caspica* Witherby 1908: southern coast of the Caspian Sea (Surdabend, Alumdeh).

Range and biotope.—(1) *P. p. pyrrhula.* Northeastern Europe, forming a western continuation of the Asiatic range. Through European Russia north to the coasts of the White Sea and in general to latitude 65°N., and south to about latitude 55°N. (provinces of Smolensk, Kaluga, Moscow, Riasan, Kazan, Ufa; see Dementiev, 1934), but absent in the Bialowiss virgin forest (Zedlitz, 1921); the coasts

of the Baltic Sea, mixed and fir forests of East Prussia (Tischler, 1941), northern Poland and northeastern Germany. In central Germany it meets the small western and the intermediate eastern European mountain races. Here it breeds in the mountains as well as in the lowlands, in parks, gardens, and even in villages. In Scandinavia it inhabits Finland, where its local distribution is determined by the extension of the *Picea* forests, in association with *Regulus regulus, Parus ater,* and *Phylloscopus collybita* (Kalela, 1938); the Kola Peninsula up to about 67°N. lat. (*fide* Stresemann, 1919), the *Picea* forests (up to about 67°N. lat.) and to a lesser degree the mixed woods of Sweden, including the island of Gotland (Kolthoff and Jägerskiöld, 1898) and the conifer and more rarely the birch forests of Norway up to 70°N. lat., although it becomes increasingly rare in southern Norway (Lövenskiöld, 1947), as is also the case in southern Sweden. Recently (1934) it has spread from southern Sweden (Skane) to Denmark (Zealand: Jespersen, 1944). Although actual nesting has never been recorded on Bornholm (Löppenthin, letter, 1948), the observations of courting bullfinches in the coniferous woodlands, as well as of family parties with newly fledged young in deciduous and mixed forests, makes it certain that the species is a breeding bird on the island and has been so probably since 1916 (Löppenthin, 1935). The westernmost breeding localities of this race appear to be situated in eastern Pomerania (near Bütow: Niethammer, 1937) and in the province of West Prussia, eastern Germany (Stresemann, 1943). In a less pure state it has infiltrated into the central European mountains, as far west as the Swiss Alps. Apart from its irregular autumn and winter migrations, this race has been recorded from as far south as Asia Minor, Greece (Stresemann, 1919), and Malta (Despott, 1917).

(2) *P. p. germanica.* The mountains of southeastern and central Europe: the submontane (1600 m.), montane, and subalpine (2300 m.) zones of the Rhodope, Perin (Alibotush: Scharnke and Wolf, 1938), and Rila mountains in southern Bulgaria (von Jordans, 1940), where it inhabits, apart from mixed woods, the dense forests of *Picea excelsa, Pinus silvestris, P. peuce,* and *P. leucodermis,* in association with *Dryocopus martius, Loxia curvirostra, Fringilla coelebs,* and *Serinus canarius* (Harrison, letter, 1948), as also the subalpine vegetations of *Pinus montana, Alnobetula viridis, Juniperus nanus,* and *Vaccinium* (von Boetticher, 1919); Greece, Macedonia (Mavrova, July, in mixed wood at 1800 m.: Fehringer, 1922), the southern Yugoslavian and northern Albanian mountains, where it is very local and rare (Ticehurst and Whistler, 1932), the Dinarice Alps, and the Balkan Mountains in northern Bulgaria. Furthermore, the mainly coniferous forests (*Abies pectinata, A. excelsa*) of the Transsylvanian Alps (Mt. Retyezát, 1250 m., June 5: Congreve, 1929), the coniferous mountain forest of Siebenburgen (von Csató, 1885), the Carpathian Mountains, including the High Tatra Mountains, to the mountains surrounding the Bohemian Basin (Cerny, 1938). It is a rare breeding bird on the Bohemian-Moravian highlands and very rare in the Bohemian Basin (Cerny, 1938). It is absent as a breeding bird on the Hungarian plains (Greschik, 1939), but it is this race that is apparently also found in the Austrian, northeastern Italian (Bolzano), and Swiss Alps, where it inhabits, apparently mixed with the race *pyrrhula,* the coniferous and mixed forests (Burckhardt and Wyss, 1947) mostly of the subalpine zone up to the tree-line (Meylan and Haller, 1946), and prefers young fir trees for nesting (Géroudet, letter, 1948). The westernmost records of this race are those from the Swiss Middle Mountains (Canton Lucerne). The breeding specimens with large dimensions found in the Vosges, where they prefer forests dominated by *Picea excelsa* up to 1200 m. alt. (Laurent, letter, 1948) represent perhaps the westernmost infiltration of this or of the northeast European race.

(3) *P. p. coccinea, P. p. nesa,* and *P. p. wardlawi.* Western Europe, from the mixed and conifer forests of the Pyrenees (Mayaud, *et al.,* 1936), along the western and northern slopes of the Alps, to southern Germany, where *coccinea* gradually merges into populations with larger dimensions; the whole of France, Belgium, and the Netherlands, although in the latter countries it is rare in the alluvial provinces; also the western half of Germany, east to about Stettin and the Hartz (Niethammer, 1937). Recently (about 1930) in Denmark (southern and central Jutland, and Alsen Island: Löppenthin, 1943; Jespersen, 1944). Also the Channel Islands (Alderney: Thompson, 1921, and 1923; Jersey: Mayaud, 1946; Herm: Mayaud, letter, 1948), and the woods, shrubberies, orchards or large gardens of Great Britain and Ireland (Witherby, *et al.,* 1938), and the conifer woodlands of the mountain regions of Scotland (Clancey, 1948), north to Caithness. These Scottish populations apparently form an ecological race, which, according to Clancey subsists extensively on heather flowers, seeds, etc., and is almost strictly confined to its coniferous biotope. It is absent in the Orkneys (Lack, 1942), although it has spread to some of the Inner Hebrides (Witherby, *et al.,* 1938). It is also a breeding bird in Italy, north of the montane (beech) zone (1000-1850 m.) of Latium (Alexander, 1917). It probably breeds

Table 1

Wing Measurements of Males of *Pyrrhula pyrrhula* in Millimeters

Localities	Collecting dates	Measurements	Averages	Sources of data
Basses-Pyrénées	Breeding birds	82, 84.5	83.2 (4)	Mayaud, 1939
	May 13, July 7	83, 83.5		Coll. Mayaud (Mayaud)
Gironde	Breeding bird	80.5		Mayaud, 1939
Charente Inférieure	"	79		"
Loire Inférieure	"	78, 81	79.0 (6)	"
Maine-et-Loire	June	77		"
Morbihan	June	78.5		Berlin Museum (Stresemann)
Seine-et-Oise	Breeding bird	83	83 (1)	Mayaud, 1939
Meurthe-et-Moselle	April	82, 85	83.5 (2)	"
Vosges	May 25, 27	84, 89	87.0 (3)	Stresemann, 1919:35
	June 26	88		Coll. Laurent (Laurent)
Kent	April-July	79, 81, 81.5, 82.5, 83, 85	82.3 (10)	Coll. Clancey (Clancey)
Suffolk	May 11, July 7	82, 84		"
	April 11, May 2	79, 85		Amsterdam Mus. (Voous)
Yorkshire	May 10-July	79, 83, 83		Leiden Mus. (Voous)
Northumberland	April 25	81	82.5 (4)	Coll. Clancey (Clancey)
Perthshire	June 14, 15	82.5, 83, 87	83.1 (5)	"
	April 7, 16	80.5, 82.5		Coll. Plowden-Wardlaw (Clancey)
Ireland	Breeding birds	79, 79, 80, 80.5, 81, 81.5, 81.5, 82, 82,83, 84, 84.5, 85, 85	82.0 (15)	Dublin Mus. (Stelfox)
	June 10	81.5		Coll. Sillem-Van Marle (Voous)
Netherlands	April 15-Aug. 7	79, 80, 82, 82, 83, 84, 84	82.0 (8)	Leiden Mus. (Voous)
	April 13	82		Coll. Sillem-Van Marle (Voous)
Westphalia	July 29	81.5	81.5 (1)	Berlin Mus. (Stresemann)
Hartz	April	83	83 (1)	Leiden Mus. (Voous)
Holstein	Aug 3	84	84 (1)	Stresemann, 1919:36
Jutland	Aug. 12	84	84 (1)	Löppenthin, 1943
Hessen	June 29	86	85.6 (5)	Stresemann, 1919
Thuringia	June 29	89		"
Lower Franconia	April 8-May 24	82, 85, 86		"
Swabia	April 15	93		"
Upper Bavaria	May 5, Aug. 4	87, 87.5		"
Bavarian Alps, 1200-1500 m.	July 29-Aug. 2	87, 90, 91, 92.5	89.4 (9)	"
Bavarian Forest	April 20, May 22	87, 89.5		"
Bohemian Forest	April 10-Aug. 7	88, 89, 90, 90, 90, 91, 92	90.0 (9)	Stresemann, 1919:33
Bohemian Basin	May 22, 28	88, 92		Cerny, 1938
High Tatra Mts.	May 13-Aug. 30	87.5, 89, 89.5, 90, 92.5, 94	90.4 (6)	"
Galicia	Aug. 12	93		"
East Carpathians	May 4-July 27	86.5, 87.5, 90.5, 90.5, 91, 91.5, 92, 93, 94, 94	91.3 (10)	"
N. W. Italy (Piedmont)	April 9	84	84 (1)	Milano Mus. (Moltoni)
N. E. Italy (Bolzano)	April 25	89	89 (1)	"
Geneva	May 24	85	85 (1)	Geneva Mus. (Dottrens)
Canton Vaud (plains)	April	85, 87	85.7+ (3)	Mayaud, 1939
Swiss Jura	Aug. 6	85+		American Mus. (Mayr)
Canton Fribourg	May 11	88		Basel Mus. (Sutter)
Canton Lucerne	April 29, May 6	89+, 92+	89.7+ (3)	Coll. Hubert (Voous)
Glarus Mts.	April 26	87	90.0+ (6)	Stresemann, 1919:35
Graubünden	May 10	92		Basel Mus. (Sutter)
Engadin	May 30, June 9	89.5, 91		"
Karinthia, Austria	June 6, July 24	89+, 91.5+		Coll. Clancey (Clancey)
Lower Austria	May 1, 3	87.5, 88.5	86.9 (7)	Cerny, 1938
"	July 11-22	83, 86.5, 87, 87.5, 88		Berlin Mus. (Stresemann)
S.W. Transsylvania, Mt. Retyezát	June 5	89	89 (1)	British Mus. (Macdonald)
S. Bulgaria	May 27	89.5	89.4 (9)	Coll. Harrison (Voous)
Rila and Pirin mts.	Breeding birds	88, 88, 89, 90, 92		Von Jordans, 1940
Macedonia	July 1-2	87, 89.5, 92		Hartert & Steinbacher, 1932
S. Yugoslavia, Korab Mts.	July 15	86	86 (1)	British Mus. (Macdonald)
West Prussia	April 8-May 20	90.5, 92.5, 92.5, 93	91.0 (11)	Stresemann, 1919:30
	May 18-26	89, 89, 89, 90, 90 91, 95		Berlin Mus. (Stresemann)
East Prussia	Breeding birds	93-96	93-96 (5)	Tischler, 1941
Esthonia	May 15-25	90, 94, 96	93.3 (3)	Stresemann, 1919:30
Denmark (Zealand)	July 9	90	90 (1)	Löppenthin, 1935
Bornholm	May 8-June 9	90, 91, 92, 96	92.3 (4)	"
Sweden (Smaland)	April 28	89.5	89.5 (1)	Stockholm Mus. (Gyldenstolpe)
Sweden (Upsala)	May 23	91	91 (1)	"
Västergötland	April 27-May 29	91, 92, 92, 92, 94, 94, 94	92.7 (7)	"
Lapland	April 18-25	93, 97	95.0 (2)	"
S. E. Norway	June 6-Aug. 5	90, 90, 91	90.3 (3)	Oslo Mus. (Woolebaek)
Finland, South and Central	May	91, 92, 94	92.3 (3)	Helsinki Mus. (Kalela)
Central Russia	.....	91-92.5	91-92.5	Sushkin, 1925
Altai, Siberia	.....	90-94.5	90-94.5	"
Transcaucasia	Breeding birds	88, 88, 88, 89	88.2 (4)	Radde, 1884
South Caspian Mts.	.....	84, 87	86.7(4)	Witherby, 1910
	May 26	88, 88		Stresemann, 1928
Asia Minor	June 11	82	82 (1)	Kummerlöwe & Niethammer, 1934
Azores	Oct. 15	89	89 (1)	Coll. Sillem-Van Marle (Voous)

Table 2

Wing Measurements of Females of *Pyrrhula pyrrhula* in Millimeters

Localities	Collecting dates	Measurements	Averages	Sources of data
Basses-Pyrénées	Breeding birds	80.5, 83	81.7 (2)	Mayaud, 1939
Meurthe-et-Moselle	April	82, 83	82.5 (2)	"
Suffolk	April 26-July 21	80, 81, 82	81.0 (3)	Coll. Clancey (Clancey)
Lancashire	May 11	78.5	80.7 (6)	"
Yorkshire	May 10-June	78, 79, 82		Leiden Mus. (Voous)
Northumberland	April 19, May 29	82, 84.5		Coll. Clancey (Clancey)
Perthshire	April 10	81.5	82.0 (3)	"
	April 3, 15	81.5, 83		Coll. Plowden-Wardlaw (Clancey)
Ireland	Breeding birds	80, 80, 81, 81, 82	80.8 (5)	Dublin Mus. (Stelfox)
Netherlands	April 8, 13	79, 80	79.5 (2)	Leiden Mus. (Voous)
Lower Franconia	April 14	84	84 (1)	Stresemann, 1919
Upper Franconia	April 27	88.5	86.4 (9)	"
Upper Bavaria	April 24	86		"
Bavarian Alps, 1200-1500 m.	July 29-Aug. 2	83, 85, 85.5, 86, 86, 88.5		"
Bavarian Forest	April 27	89		"
Bohemian Forest	April 13-16	86, 87, 89, 90	87.4 (5)	Stresemann, 1919:34
Bohemian Basin	May 22	85		Cerny, 1938
Sudeten Mts.	Aug. 18	89	89 (1)	"
High Tatra Mts.	May 22	95	95 (1)	"
East Carpathians	May 25-July	85.5, 86, 89	86.8 (3)	"
Canton Vaud (plains)	April	84	84 (1)	Coll. Meylan (Mayaud)
Glarus Mts.	April 26	83	86.0 (2)	Stresemann, 1919
Salzburg	Aug. 1	89		"
Lower Austria	May 3	86	87.2 (6)	Vienna Mus. (Sassi)
"	April-May 3	87, 90		Cerny, 1938
" (700-1400 m.)	July 14-22	84.5, 87.5, 88		Berlin Mus. (Stresemann)
Rila and Pirin mts.	Breeding birds	86, 87	86.5 (2)	Von Jordans, 1940
West Prussia	April 8, May 24	91, 92.5	89.6 (6)	Stresemann, 1919:31
	May 18-26	87, 88.5, 89, 89.5		Berlin Mus. (Stresemann)
East Prussia	Breeding birds	90-93	90-93 (3)	Tischler, 1941
Bornholm	May 20	89	89 (1)	Löppenthin, 1935
Sweden (Smaland)	April 28	88	88 (1)	Stockholm Mus. (Gyldenstolpe)
Sweden (Upsala)	May 23	90	90 (1)	"
Västergötland	April 27, May 29	90.5, 91	90.7 (2)	"
Lapland	April 18	94	90.0 (2)	Amsterdam Mus. (Voous)
Finmark	July 21	86		Oslo Mus. (Wollebaek)
S. E. Norway	July 3	90	90 (1)	"
Finland, South and Central	May	89, 90, 92	90.3 (3)	Helsinki Mus. (Kalela)
Transcaucasia	Breeding birds	85, 88, 90	87.7 (3)	Radde, 1884
Azores	October 15	88	88 (1)	Coll. Sillem-Van Marle (Voous)

on the Iberian Peninsula, but has never been recorded so (see also von Jordans and Steinbacher, 1941), although the species has been mentioned from mixed oak- and pine-groves in Galicia on May 13 (Ticehurst and Whistler, 1928).

(4) *P. p. rossikowi* and *P. p. caspica*. Caucasian and Transcaucasian mountains, breeding near Tiflis in deciduous forests up to 2200 m. alt. and higher (Radde, 1884), and in the Akhalzikh District from 1200 m. upwards (Buturlin, 1906); southern Caspian Mountains, from the beech forests (up to the tree-line) of Talysh (Radde, 1884), to the provinces of Gilan (up to 2000 m. alt.: Stresemann, 1928*b*), Masanderan and Astrabad; furthermore the Khorassan and the eastern Afghan mountains, bordering the Persian deserts (Desht-i-Kewir: Sarudny, 1911). It ranges westwards to the wet mountain forests of *Picea* and *Abies* of northern Asia Minor (Ilgaz Dagh, Paphlagonia: Kummerlöwe and Niethammer, 1934). It is absent in Crimea (Pusanov, 1933). In this whole area the two races seem to be rare and local breeding birds. In winter, however, the species seems to be quite common, although by far the majority of winter specimens are northern stragglers of the race *pyrrhula*. In wing length, a male and female from Astrabad, Transcaspia (February-March) in the collection of Sillem-Van Marle measure 93 and 91 mm., respectively.

Pyrrhula murina Godman

Characters.—Like *P. pyrrhula*, but upper and under parts in male olive gray with ochraceous brown edgings to the feathers of abdomen and rump; in the female, upper parts are dark olive brown and under parts buffy gray.

Subspecific variation.—None.

Range.—Azores (eastern San Miguel). Very rare.

Biotope.—Formerly orchards and gardens in cultivated areas, where the birds were highly injurious, eating and destroying the blossoms of peach trees. As a result of their destructive habits, their numbers have been seriously diminished by farmers. Moreover, their rareness has attracted a few thoughtless museum-collectors (see Hartert and Ogilvie-Grant, 1905; Murphy and Chapin, 1929 and 1930; Lowe and Bannerman, 1930). At present the remaining (?) birds seem to be restricted to the dense forests (*Juniperus*!) of the mountain slopes. Correia found the species in the same biotope as *Turdus merula, Erithacus rubecula, Sylvia atricapilla, Regulus regulus,* and *Fringilla coelebs.*

Material examined.—1 ♂, 1 ♀: San Miguel (Coll. Sillem-Van Marle).

History.—The following details in the recent distribution of the European bullfinches may serve as a key to the reconstruction of the postglacial history of the species: (1) Russian and Scandinavian birds are indistinguishable in coloration and dimensions from the Siberian ones. (2) Except for British and Dutch birds, *P. pyrrhula* of Europe does not exhibit any color differentiation, although the geographical variation in size is great. (3) Southeastern European birds are intermediate in size; during the breeding season they are exclusively mountain birds. (4) Birds from western France and Britain are smallest in size. They are forest and parkland birds. (5) Breeding birds with very large dimensions, which match those of the race *pyrrhula,* have been repeatedly found in the Alps. (6) No bullfinches occur in north Africa, the Canary and Cape Verde islands.

Uniform populations of the race *pyrrhula* inhabit the enormous region which extends from Yakutia in eastern Siberia to Scandinavia. Its European range consists mainly of those regions that were covered by inland ice or tundra during the last glacial period. Hence, it is rather certain that *P. p. pyrrhula* is a postglacial Asiatic invader into Europe, as are *Dendrocopos m. major, D. l. leucotos* and *D. m. minor* but probably these latter races have had a somewhat different postglacial history (see Voous, 1947). In most parts of its range, *P. p. pyrrhula* is a bird of the taiga, preferring mixed forests in which conifers dominate. The distribution of *Picea excelsa* in many countries has a primary influence upon its local range. The occurrence of occasional large individuals breeding in the Swiss Alps is reminiscent of the occurrence of Greater Spotted Woodpeckers resembling the Scandinavian race *major* in the same region, and of *D. l. leucotos* as a rare breeding bird or accidental visitor in the southern German mountains and in the Alps (Voous, 1947). It seems as if these alpine individuals represent the remnants of those populations which formerly had a more clearly pronounced boreal-alpine distribution. Consequently, one may suppose that during the period that birch and pine (and *Picea* in the East) were the dominant trees in temperate and northern Europe (preboreal to boreal time), these bird species had a wide distribution, especially in the eastern and central parts of their range.

The postglacial penetration of these Asiatic populations into Europe was perhaps facilitated by the rapid northward and westward extension of the range of *Pinus silvestris,* which had a main glacial refugium in eastern Europe, as also by the westward extension of *Picea excelsa,* which did not survive west of the Alps (Bertsch, 1935). When in later times the mixed oak forests separated the conifer woods of the central European mountains from those of northern Europe, continuous populations remained in the northern taiga, but the alpine populations became almost isolated.

The postglacial presence of Asiatic bullfinches in Europe is confirmed by the finding of subfossil bones of large dimensions in Hungary (*fide* Geyr, 1919). These rather common remains are referred by Lambrecht to *P. p. major*! They have been found associated with remains of *Nucifraga macrorhynchus*(!), *Garrulus glandarius, Coloeus monedula, Turdus viscivorus,* and *Nyctea.* The rather varying measurements of alpine

breeding bullfinches (wing, males, 85-92; females, 83-90 mm.) lead one to conclude that the Asiatic birds have not been the only bullfinches that managed to occupy the alpine conifer forests, but they suggest that the southeast European mountain birds also succeeded in penetrating into the Alps, thus starting the process of the elimination of the boreal-alpine race *pyrrhula*. Elimination also takes place in the western Alps through the gradual penetration of the small western European race, which, especially in western Switzerland, obscures the racial situation. One might remember that there are also evidences in favor of the assumption that the alpine *Dendrocopos m.* "*alpestris*" is subject to a similar elimination by a western and central European form ("*arduennus*," *pinetorum*). A breeding specimen of *Pyrrhula* from the low regions near Geneva belonged to the small race; in this locality, however, it is a very rare breeding bird (Géroudet, letter, 1948).

In those countries where the Asiatic *pyrrhula* meets European populations (Carpathian Mts., Poland, southern German mts.), the breeding birds are exactly intermediate in measurements and show a rather wide range of variation (wing of Carpathian breeding males, 86.5-94; females, 85.5-95 mm.!). In the same regions corresponding intermediate populations of *Dendrocopos major* are found! Owing to the fact that the geographical variation of *Pyrrhula* can be expressed in average wing lengths, a slightly clearer picture can be made than in the case of *D. major*. The average wing length in eastern European populations decreases from east to west (see Cerny, 1938). Influences of populations with large dimensions are found as far west as in the Bohemian Forest and the Bavarian Alps. Breeding males in the latter locality have wing measurements that equal the mean of Scandinavian breeding birds (92.5 mm.). Some of the rather large measurements which are occasionally noticed in southern German populations might also be caused by a northeast European influence.

The penetration of *P. p. pyrrhula* as well as that of *Dendrocopos m. major* into Scandinavia must have occurred after the melting of the greater part of the Scandinavian ice-cap. It seems that at the initial stage of the Ancylus Lake, which was a primordial stage of the Baltic Sea, Finland was wholly free from land-ice as early as about 7000 B.C. (Zeuner, 1946). Only after that time does there seem to have been enough room for the immigration of forests and forest birds southward along Sweden. This must have happened not before about 6000 B.C. (late Boreal to Atlantic). At the same time hazel, alder, and later also mixed oak forests had occupied the southern part of Sweden, which was at that time connected by land with Denmark, thus separating the Ancylus Lake from the North Sea. It is rather reasonable that an extension of west and central European forest birds into southern Sweden took place during that time, which perhaps is the cause of the phenomenon that southern Scandinavian breeding *P. pyrrhula* tends to be, on the average, slightly smaller than birds from more northern regions and from Siberia, thus resembling the western European race. Nevertheless, the same phenomenon has been established in the distribution of *Dendrocopos m. major*, which is less typical in southern Sweden than in northern Sweden and Finland.

Quite recently the race *pyrrhula* has spread from southern Sweden (Skane), where it is a rare breeding bird, to Bornholm Island (1916) and to the island of Zealand (1934). This new penetration could be established easily owing to the fact that up to these dates no representative of *P. pyrrhula* had been found as a breeding bird in these areas. In the case of *Dendrocopos major* the penetration of the Scandinavian form into Denmark via the same route could be traced less easily. Nevertheless, one should remember that a clear influence of the race *major* could be noticed in a sample of Danish specimens of *D. major*, which proved to be referable neither to typical *pinetorum* nor

to *major*. The Bornholm race of *D. major*, however, proved to be just intermediate between the races *major* and *pinetorum* (Voous, 1947).

An additional characteristic of *P. pyrrhula* and *D. major* is the irregularly occurring autumn migrations, which sometimes involve whole populations. Regular migratory movements may be responsible for the presence of *P. p. pyrrhula* in southeast Europe as a common winter bird. Formerly this led to the conclusion that it was this race that was the breeding one in Bulgaria and Yugoslavia. But in some years it is so extraordinarily abundant (*e.g.*, 1927-28, hundreds in Thuringia, 15-20 thousand in Slovenia: Stresemann, 1928*a*), that the invasional character of these movements is quite clear. In western Europe the race *pyrrhula* is rather scarce in most winters, but in particular years it is quite common. The year-to-year irregularity in abundance has been noticed from Denmark to France and Great Britain. It is this race that has straggled to the Faeroes (Salomonsen, 1942) and on several occasions even to Iceland (wing, males, 93, 93; females, 89, 90, 90, 91 mm.: Saemundsson, 1929; Gudmundsson, letter, 1948). There seems to be no record of this race from Ireland (Humphreys, 1937). Whether or not all Swiss and Italian bullfinches with large dimensions originate in northern Europe or represent indigenous alpine breeding birds cannot be decided in each case. The frequent occurrence of bullfinches in northern Italy which are conspicuously larger than the majority of Italian specimens is reminiscent of the rather irregular occurrence of the "Scandinavian type" of *Dendrocopos major*, which perhaps also must be referred to alpine breeding birds rather than to northern stragglers.

Although the last glaciation (Würm) did not extend as far south as the penultimate one (Riss), boreal and alpine ice-caps approached each other at a distance of not less than about 53 km. (Firbas, 1939). It is not probable that species of *Pyrrhula* and *Dendrocopos* could have survived in the tundra and dwarf-willow vegetation that prevailed between the ice-caps in central Europe. Consequently, a separation between geographically isolated west and east European populations must be assumed. These populations have smaller dimensions than those which survived in the Siberian refuge (*pyrrhula*). The large dimensions of the latter birds might be an adaptation to the severe continental climate (rule of Bergmann). During the optimum of the last glaciation the remains of subarctic birch and pine forests have been found as far north as the Paris Basin whereas warmth-loving trees occurred in the Etruskian Apennines and in southern France (Firbas, 1939). As a consequence, the glacial refuge of *P. pyrrhula* can be assumed to have been situated in the southern half of France and in Italy.

The apparent postglacial center of dispersal of the race *coccinea* corresponds with this location. Fossil remains of the small race are recorded by Lambrecht (1933) from Pleistocene deposits of Ireland and from northwest Switzerland (Basel). They have also been identified in a bone-breccia from Sardinia, where the species is now absent (*loc. cit.*). After the retreat of the land-ice, the *Pyrrhula* populations followed the subsequent extension of the forests into western Europe, including Great Britain and Ireland. This happened at the time that the English Channel and the Irish Sea still formed land-connections (Boreal). They migrated also north of the alpine range into Germany. In the latter locality they met the Asiatic race *pyrrhula* and formed populations with intermediate average dimensions and a wide range of variation. As in *Dendrocopos major, D. minor,* and *Garrulus glandarius*, a slight clinal variation is noticeable in the western European form *P. p. coccinea* which corresponds with the direction of the postglacial extension of the range. The dark coloration of the British and Dutch populations, including those of Alderney Island in the English Channel, but not those of the Island of Jersey (Mayaud, letter, 1948), might be the result of Atlantic climatic conditions, which induce a more intensified feather pigmentation. This type of variation

reaches its optimum in the weakly differentiated race *wardlawi* from the Scottish mountains.

Whether the recent absence of this species and of *Dendrocopos minor* from Denmark has an historical or rather a local cause, I cannot decide. Many other forest birds and deciduous forest trees have actually reached Denmark and have spread to southern Sweden, for example, *Dendrocopos medius*. This must have happened during the time that there was still a land connection between Jutland Peninsula and southern Sweden (Boreal). At this time, in the English Channel and the Irish Sea areas, land connections also occurred (Zeuner, 1946). Quite recently, *P. pyrrhula* has reached Jutland (again?) from the south. Measurements of Danish breeding birds show that the new Danish populations are a continuation of the western European populations.

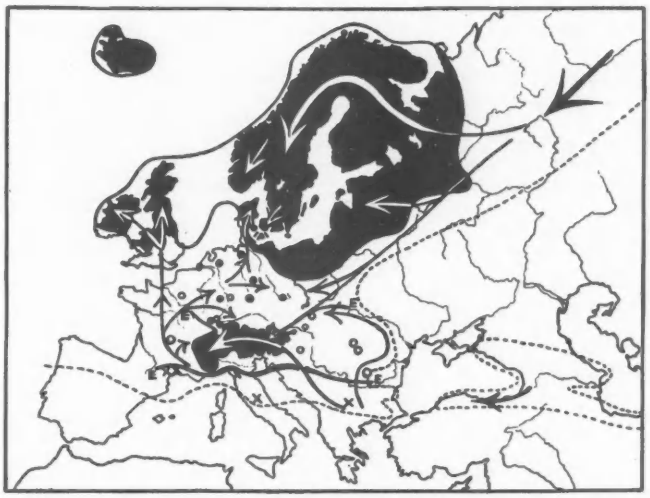

Fig. 9. Postglacial distribution of *Pyrrhula pyrrhula* in Europe. Black areas were covered by land ice during the maximum of the last glaciation. Ice-covered regions in the Caucasus are not indicated. Black spots indicate localities where treeless vegetation is known to have existed during the last glacial period; small circles indicate birch and pine forests of that period; crosses indicate deciduous forest vegetation with warmth-loving trees also of that period (see Firbas, 1939:fig. 6). Two black lines with ends indicated by "E" represent the approximate boundaries of the tundra and birch-pine forests, north to south, respectively. The broken line indicates the southern limits of distribution of *P. pyrrhula* in Europe; in the Caucasus this line indicates approximate range.

Pollen-analysis has shown that forest vegetations survived during the last glaciation in many parts of southeast Europe. The subarctic birch-pine forests in the western Pannonic lowlands and in western Siebenburgen, as well as the deciduous woods in the eastern Serbian mountains (Firbas, 1939), represent the most convincing evidence in favor of the localization of a glacial refugium of forests which were suitable for the existence of *P. pyrrhula*. Originating from this center of dispersal, the birds spread to the mountains surrounding the Hungarian plains and the Bohemian Basin; they apparently also penetrated into the Alps. The southeast European race is a mountain race

everywhere. The wide range of variation in dimensions found in Slovenian and Bohemian birds, as well as in those inhabiting the Alps and the south German mountains, might be the result of the interbreeding of three different waves of populations, which came from the northeast (*pyrrhula*), southeast (*germanica*), and west (*coccinea*). These populations will remain to be an obstacle to any subspecific nomenclature. In the assumption that the central European populations represent "mixed" or "hybrid" ones, I follow Stresemann (1919), although I differ in opinion as to what races actually meet and "hybridize."

In its doubtful occurrence as a breeding bird in the Iberian Peninsula, and in its absence in Italy south of lat. 42°N., as well as in Greece south of lat. 40°N., *P. pyrrhula* exhibits its exclusive partiality to forests or parklands. This absence and scarcity in the Mediterranean region may be correlated with the postglacial retreat of the forests, caused both by human agency and by the general desiccation of the climate. This suggestion is confirmed by Pleistocene fossil records from Sardinia (Lambrecht, 1933), where the species is now absent.

The occurrence of only two slightly distinct races in the Caucasian and south Caspian regions might be considered to be an indication that the bullfinch is a rather recent inhabitant of these regions. The race *rossikowi* still inhabits approximately its last glacial Caucasian refuge. Therefore, *rossikowi* is of a corresponding age as the southeast and west European races. It has the measurements of the southeast European birds, but the colors of the male are slightly brighter and of the female darker. It is the race-analogue of *Dendrocopos major tenuirostris*. Like that race of Pied Woodpecker, *rossikowi* has extended its range westward in Asia Minor (Ilgaz Dagh), where Kummerlöwe and Niethammer (1934) found the species breeding in mossy mountain forests with *Picea* and *Abies*. The collected specimens have the same coloration as *rossikowi*, but they are smaller. These bullfinch populations correspond to *Dendrocopos major paphlagoniae*, which was thought to be a postglacial immigrant from Transcaucasia, although it might be a postglacial relict as well (Voous, 1947). It is unknown if the south Caspian and north Persian race (*caspica*) is an older inhabitant than *rossikowi*; hence it is not certain that it is comparable with *D. major poelzami*. However, there is one argument in favor of the fact that *P. pyrrhula* inhabited Europe before the last interglacial: its occurrence in the Azores. Although the Azorean form (*murina*) is taxonomically quite distinct from all other races of *P. pyrrhula*, lacking as it does any sexual difference in plumage and a white rump, yet its geographical relations make difficult the assumption that it is not an insular offspring of *P. pyrrhula*. As the Azores are Tertiary volcanic islands which never had any land connection with the continent, the time of the immigration cannot be correlated with any post-Tertiary geological event. The species must have reached the islands by wing as a straggler from Europe (1380 km. west of Cape da Roca, Portugal). This supposition is also necessary for explaining the occurrence of other Azorean breeding birds: *Turdus merula azorensis, Erithacus rubecula rubecula, Sylvia atricapilla heineken*, and *Regulus regulus azoricus*. Some of the latter species, however, might have reached the Azores via the Canary Islands. In this respect, it is of interest to notice that stragglers of *P. p. pyrrhula* have reached Iceland, crossing the Atlantic Ocean, and that the European *Turdus viscivorus* (Hartert and Ogilvie-Grant, 1905) and *Turdus pilaris* are very rare stragglers to the Azores, the latter species having been recorded only once after a heavy northeast gale (Spolton and Mayaud, 1947).

The taxonomic distinctness of the Azorean Bullfinch, with its hen-feathered male, lack of a white rump, and brown instead of white under tail coverts might suggest that it is a rather old inhabitant, probably older than the last interglacial. This makes it also

possible that *P. p. caspica*, like *Dendrocopos major poelzami*, represents an older generation than the Caucasian race *rossikowi*.

On these grounds, it might be desirable to treat the Azorean Bullfinch as specifically distinct from *P. pyrrhula*, since this is the only way to indicate close relationship among subspecies of the entire Palearctic region. If this is done, the insular *P. murina* should be united with *P. pyrrhula* in a superspecies.

SUMMARY

1. The genus *Pyrrhula* (bullfinches) has an Oriental and Palearctic range; it does not occur in other zoögeographical regions.

2. Bullfinches are inhabitants of forests of various kinds, although not of tropical or subtropical types. In western Europe, they live also in parklands and gardens.

3. The following eight species of *Pyrrhula* are recognized: *nipalensis, leucogenys, erythaca, erythrocephala, aurantiaca, griseiventris, pyrrhula, murina.*

4. The Oriental forms have been united in the subgenus *Protopyrrhula* Bianchi, whereas the Palearctic forms have been referred to the typical subgenus *Pyrrhula.*

5. Sympatric species are only found in the Oriental range of the genus (*nipalensis* with *erythaca, erythrocephala,* and *aurantiaca*). *P. nipalensis* differs from the other three in biotope and vertical distribution, but *nipalensis* and *erythaca* occur side by side at least in the mountain forests of Yunnan and Formosa.

6. Interspecies (Ripley, 1945), with a marginal zone of overlap, can be recognized in the three Himalayan forms (*erythaca, erythrocephala,* and *aurantiaca*).

7. Emergent interspecies (Ripley, 1945), with a marginal zone of hybridization, have been found in the Siberian forms (*griseiventris, pyrrhula*).

8. Superspecies, with geographically complementary continental and insular forms, have been recognized in southeast Asia (*nipalensis, leucogenys*) and in western Europe (*pyrrhula, murina*).

9. Clinal variation occurs most noticeably in the European races of *P. pyrrhula.*

10. The greatest number of sympatric species occurs in the Chinese-Himalayan countries. In Bhutan alone, Ludlow observed the following three species: *nipalensis, erythaca, erythrocephala.*

11. *P. nipalensis* has been considered to be the most primitive form. Juvenal birds of all members of the genus resemble this plainly colored brown form. It has a rather wide southeast Asiatic range, which is discontinuous.

12. The primitive southeast Asiatic forms occur on the margins of the range of the genus; they inhabit isolated mountain regions in southern Malaya (*P. n. waterstradti*), and the Philippines (*P. leucogenys*).

13. The Japanese and Manchurian bullfinches (*P. g. griseiventris*) are a rather variable form, which, however, does not seem to have originated as a "hybrid" between the gray-breasted *P. g. cineracea* and the red-breasted *P. p. pyrrhula.*

14. The area between Yakutia in eastern Siberia and Norway and Denmark in western Europe is inhabited by one subspecies, *P. p. pyrrhula,* which is constant throughout this enormous range.

15. In Europe three continental races of *P. pyrrhula* have been recognized according to average dimensions: a small form in western Europe (*coccinea*); an intermediate form in southeast Europe (*germanica*), and a large form in north and northeast Europe (*pyrrhula*). Intermediate populations occur in central Europe.

16. The Caucasian and south Caspian races of *P. pyrrhula* (*rossikowi, caspica*) resemble the southeast European race rather than the Russian one.

17. The British and Dutch bullfinches show a slightly darkened coloration, which may be caused by Atlantic climatic conditions.

18. *P. pyrrhula* is a breeding bird of Ireland; until quite recently it was absent from Denmark.

19. The virtual absence of the genus in the resident fauna of the Mediterranean region has been correlated with deforestation and desiccation of the climate, rather than with historical distributional events. However, the genus does not appear to have ever reached northern Africa.

20. The Azores, which are Tertiary volcanic islands, are inhabited by a hen-feathered offshoot of the European form. This species (*murina*) is on the verge of extinction.

CONCLUSIONS

1. The center of origin and dispersal of *Pyrrhula* and *Dendrocopos* may be situated in southeast Asia (Chinese-Burmese region).

2. Recent distribution and character geography reveal that the Himalayan species of *Pyrrhula* and the "ladder-backed" group of *Dendrocopos* have reached their ranges from the East.

3. The Palearctic species of *Pyrrhula* and *Dendrocopos* originated from some Chinese form, although taxonomy and recent distribution in *Pyrrhula* do not give the clue as to which form this may have been.

4. Manchuria has acted as a secondary center of dispersal of the Palearctic forms of *Pyrrhula* and *Dendrocopos*.

5. An interglacial (or interstadial) dispersal of *Pyrrhula* and of *Dendrocopos major* has taken place from Manchuria along the then forested northern boundary of the Mongolian Desert.

6. During the last glaciation, *Pyrrhula* and *D. major* survived in at least four Asiatic continental forest refugia: Manchuria, Kamchatka, Transbaicalia, and south-central Siberia.

7. Northeast and north Europe have been populated postglacially by birds from the Siberian taiga (*Pyrrhula* and *Dendrocopos*).

8. In accordance with the rule of Bergmann, the Siberian (including the northeast European) birds show considerably larger dimensions than the southeast and western European populations in both *Pyrrhula and Dendrocopos*.

9. In both *Pyrrhula* and *Dendrocopos* invasions from Siberia have penetrated into Scandinavia from the north.

10. South Scandinavian populations of *P. pyrrhula, D. major*, and *D. minor* show a slight west European influence, which might be the result of a former (late Boreal to Atlantic) northward extension of the range of west European birds.

11. Indications of a penetration of birds from the Siberian taiga into the Alps, resulting in a still recognizable boreal-alpine distribution, have been found in *P. p. pyrrhula, D. m. major*, and *D. l. leucotos*.

12. The whole of temperate Europe has been populated by two groups of populations of *P. pyrrhula, D. major*, and *D. minor*, having spread postglacially from southeast and southwest Europe, where they survived during the last glaciation.

13. In the central European mountains, the outposts of three glacially separated populations of *P. pyrrhula, D. major*, and *D. minor* intermingle, originating from the northeast, the southeast, and the southwest.

14. In the west European element (*P. pyrrhula, D. major, D. minor*), a distinct clinal variation takes place from northwest Italy and southern France to Denmark. This very gradual variation is hardly worthy of nomenclatural notice. The phenomenon is less pronounced in the bullfinch than in the woodpeckers.

15. British populations of *P. pyrrhula, D. major,* and *D. minor* show some racial color distinctions, which may be correlated with Atlantic climatic conditions.

16. Caucasian populations of *P. pyrrhula, D. major, D. leucotos,* and *D. minor* belong to the same glacial generations as the southeast and southwest European ones. Taxonomically they are closer to the southeast European than to the Russian forms.

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THE NON-HERITABLE ASPECTS OF FAMILY UNITY IN BIRDS

By JOHN E. CUSHING and A. O. RAMSAY

Most species of birds are known to form individual family groups in which parents and young remain associated until the group disperses with the maturation of the young. The most striking feature of such family groups is the high degree of specificity that they exhibit, in that each family is maintained as a unit and distinction is made among different families. In many cases this specificity does not appear to be genetically determined, for it is well known that a variety of kinds of birds will hatch and attempt to rear the young of kinds other than their own (see Nice, 1943, for references). Observations of this sort suggest that the genetic factors underlying the behavior patterns involved in the initial formation of family units have in themselves a very low order of specificity and that any specificity which develops is established largely on a non-heritable basis.

In other words, the specific components of the initial formation of family bonds in birds do not seem to have heritable determinants, but appear rather to be established as a result of conditioning or imprinting acting at the time of hatching. Parents and young thus appear to inherit a generalized ability to form a family association, the specific features of which are not inherited.

In this respect such behavior resembles a number of other activities of birds that also owe their specific expression to non-heritable determinants. Such activities are of interest not only for their own sake, but because some of them would seem potentially capable of affecting the genetic composition of the populations in which they occur (Cushing, 1944). In these cases one finds evidence favoring the occurrence of the so-called phenomenon of "organic selection," the existence of which was postulated long ago by Lloyd-Morgan and others, but which has received little attention recently (Cushing, 1941; Huxley, 1942; Gause, 1947).

As the family bond forms the basis for the perpetuation of the other non-heritable behavior patterns noted above, and as little attention has been paid it from an experimental point of view, the present paper presents some experiments designed to test the strength and specificity of the bonds in various families of birds and to establish a basis for later work on the nature of the factors involved. In this paper no more is attempted than a demonstration of the reality of the bond and a rough measure of its strength under disruptive influences.

Although the majority of observations reported was made upon chickens and ducks, the literature cited demonstrates that a variety of other birds also show similar behavior giving some probability to the general applicability of the observations reported here.

The reader should note that we are employing various anthropomorphic terms in preference to coining new words or using relatively clumsy sentences. This is done with full realization that it would be difficult to establish human counterparts to the behavior noted even if these exist. In fact, and to the contrary, it is apparent that the behavior reactions involved, while highly specific, are stereotyped and apparently established at non-conscious levels.

The observations recorded here were made on birds reared in the J. Rulon Miller wildlife area maintained by one of the authors (A. O. Ramsay) on the grounds of the McDonogh School, McDonogh, Maryland. Here it was possible to observe the behavior of several kinds of birds that had been induced to form heterospecific family groups as a result of the hatching of the eggs of one species under the females of another. Table 1 indicates combinations made during two seasons, 1947 and 1948.

Table 1
Composition of Families

No.	Parent	Young	Hatching date
Homospecific			
1	Pekin duck	3 pekin ducklings	May 29, 1947
2	Pekin duck	3 pekin ducklings	June 16, 1947
3	Barred rock hen	12 bantam chicks	May 25, 1947
4	Barred rock hen	10 bantam chicks	May 27, 1947
5	Barred rock hen	25 barred rock chicks	Sept. 20, 1947
Heterospecific			
6	Bantam hen	4 bobwhite quail	June 3, 1947
7	Rhode Island red hen	3 black duck	June 1, 1947
8	Rhode Island red hen	13 mallard	June 7, 1947
9	Rhode Island red hen	3 turkey (game farm)	June 4, 1948
10	Rhode Island red hen	2 turkey (game farm)	June 4, 1948
11	Muscovy duck	1 mallard	May 21, 1948
12	Domestic pigeon pair	1 bobwhite (killed by male at 24 hrs.)	June 15, 1948
Heterogeneous			
13	Barred rock hen	5 muscovy, 2 pekin, 5 barred rock chick	May 24, 1948
14	Bantam hen	1 pheasant, 4 bantam	June 11, 1948
15	Bantam hen	2 mallard, 4 bantam, 1 barred rock	June 10, 1948
16	Mallard hen	2 hybrid (black duck x mallard) 4 mallard	May 14, 1948
17	Mallard hen	3 pekin, 4 mallard, 4 hybrid	May 19, 1948

The usual technique employed was to place eggs of the desired type under broody females confined in wooden nest boxes, each of which opened into enclosed chicken wire runways (2x2x6 ft.) resting on the ground. The families held in these cages were not over twenty feet from each other at the most and could readily see and hear each other as well as some dozen muscovy and pekin ducks and chickens that moved through the area unconfined. In addition, domestic pigeons were rearing young in the same area and chukar partridges and pheasants were present in cages where they could be heard easily. During the second season, two Canada geese and several black and mallard ducks also roamed the area.

There was little doubt that each family unit was well established in the first few days. The young in every case recognized their foster mother, whether of the same or different species, and responded to her behavior. For example, by this time bantam hen 6 was observed to catch flies, call the young bobwhite quail to her, and feed them, which continued until they were able to perform this on their own. In addition, the various species responded to the food and alarm notes of their own mothers and not to those of other individuals.

The families, then, behaved as one might have predicted from a general knowledge of poultry raising practices and from the literature, and even though they were all reared in sight and sound of each other. It seemed desirable, however, to construct some tests upon the relationships involved in order to obtain data regarding the strength of the bond between parent and offspring under varying circumstances.

With this in mind, combinations were made in which two or more family units were placed together in the same enclosure (made by joining two of the runs described above). One such experiment was tried by placing pekin duck 1 and her ducklings in the same enclosure with Rhode Island red 7 that was mothering black ducks. In this case the duck's brood of ducklings was allowed to come to her from their home box about twelve

feet away. This they did readily in response to her calling, answering themselves until they were able to pass through the opening and join their mother in the cage. Once together in the enclosure, the two famlies continued to remain intact in spite of the fact that they were repeatedly stirred up either by us or by their own activities. It was obvious that the ducklings of both species were capable of finding their own parents and that they actively sought them out when removed. In addition, aggressive action on the part of the adult birds, particularly the hen, was observed to add further stability to the family group; for young birds were attacked whenever they approached too closely to the wrong parent. Both parents and young, then, appeared able to distinguish each other under the conditions of the experiment which lasted for an hour.

An additional test of the strength of the parent-young relationship was had when hen 3, fostering bantam chicks, was placed in the same enclosure with the above families 1 and 7 and allowed to call her young to her. There was some fighting between the

Table 2
Families Confined Together

No.	Parent	Age of young in days	Time together in hours	Results
7	Rhode Island red—3 black duck	3	1½	Original groups intact
1	Pekin duck—3 pekin	6		
3	Barred rock hen—12 bantams	9	½	Original groups intact
	Added to above groups			
14	Bantam—1 pheasant, 4 bantam	3	1	Original groups intact
15	Bantam—2 mallard, 4 bantam, 1 barred rock	4		
9	Rhode Island red—3 turkeys	13	1	Original groups intact
13	Barred Rock—5 muscovy, 2 pekin, 5 barred rock chick	23		
9	Rhode Island red—3 turkeys	13	1	Original groups intact
10	Rhode Island red—2 turkeys	13		
9	Rhode Island red—3 turkeys	16	1	Original groups intact
14	Bantam—4 bantam (pheasant dead)	9		
10	Rhode Island red—2 turkeys	16	4	Original groups intact
15	Bantam—4 bantam, 2 mallard, 1 barred rock	10		
13	Barred rock—5 muscovy, 2 pekin, 5 barred rock chick	27	4	Original groups intact
15	Bantam—1 barred rock, 2 mallard, 4 bantam	10		
10	Rhode Island red—2 turkeys	16	18	Original groups intact
13	Barred rock—5 muscovy, 2 pekin, 5 barred rock chick	27		
9	Rhode Island red—3 turkeys	16	17	Original groups intact
15	Bantam—2 mallard, 4 bantam, 1 barred rock	12		
10	Rhode Island red—2 turkeys	18	20	Original groups intact
9	Rhode Island red—3 turkeys	18		
13	Barred Rock—5 muscovy, 2 pekin, 5 barred rock chick	2	11 days	See text
17	Mallard—3 pekin, 4 mallard, 4 hybrid	7		
16	Mallard—2 hybrid, 4 mallard	12		
11	Muscovy—1 mallard	5		

two hens during the ensuing thirty-minute interval which served to completely mix the families several times; but, again, there was no question that both young and parents reacted specifically so as to reform their original units. These observations were confirmed by similar experiments repeated at other times and summarized in table 2.

One of the last to be performed was carried out for considerable time and involved four families including a muscovy (11), barred rock hen (13) and two mallards (16 and 17) as mothers with assorted young ducklings and chicks as noted in table 2. These families were color-banded and confined together in a pen 6x20 feet for eleven days. The hen kept her family intact during the entire period, but the young of the two mallards formed a single family at the end of the first day. This, however, was apparently due to the fact that the two mallard mothers remained inseparably together themselves. In this connection it is notable that these birds were sisters from a family (8) studied the year before. The muscovy kept her single mallard young for three days at which time it joined the large group belonging jointly to the mallards. Relationships persisted like this until the eleventh day when the ducks were released.

At this time it was believed that no original distinctions existed within the large family group formed under the mallards. However, a day after release the single mallard associated with the muscovy rejoined her on the pond to remain until killed by a turtle three days later. This suggests that in an unenclosed area the two mallard families might also have segregated. Unfortunately, this could not be tested, for one mallard and some young were removed to another pond when released.

In addition to the experiments reported above, various attempts were made to incorporate young into groups other than their own. These results are summarized in table 3. While the data presented are not extensive they do show that definite and highly specific barriers to adoption exist which are relatively difficult to overcome. The data also indicate that more extensive work will show that adoption is more apt to occur when the age and general appearance of an introduced bird approximates that of the young in the family with which it is to be united, and in younger rather than older families. It also favors the view that factors of species recognition do not influence the success of adoption at least to an obvious degree. It is hoped that the adoption technique will be of value in studying this point further.

DISCUSSION

A consideration of the above data shows that the heterospecific family groups which can be formed between a variety of species of birds are, in some cases at least, sufficiently stable to maintain themselves even when the families concerned are raised in close contact and subjected to artificial situations designed to disorganize and regroup them. They also confirm the point, in several instances at least, that behavior of both young and adults operates to maintain the family, parental birds resisting the intrusion of foreign young and young birds seeking their own parents. That the relative stability given to families by such interlocking behavior can, of course, be circumvented even in natural conditions, may be seen from the adoption of extraneous young in various species such as bobwhite quail (Stoddard, 1946) and by the communal habits of forms like *Crotophaga* (Davis, 1942) and the California woodpecker (Ritter, 1938).

This work also substantiates the view that in many birds the specificity of the family unit is not primarily established through genetic determinants. However, although a survey of the literature suggests that the same is true for a diversity of species, observations exist to indicate that this is not an invariable situation and that genetic determinants of this specificity will be found to have evolved in some species (see, for example, Lashley, 1915).

Table 3

Adoption Experiments

No.	Adoption family and age of young	Transfer young and age	Family	Time together	Result
3	Barred rock hen—	Mutual exchange of four		—	Adopted immediately.
4	12 bantams, 3 days Barred rock hen— 10 bantams, 1 day	chicks between groups			
5	Barred rock hen—	25 barred rock chicks,			Adopted immediately.
	no young	1 day old from hatchery			
	25 barred rock	19 barred rock chicks,			Killed four but accepted
	chicks, 10 days	1 day old		—	rest after five days.
	25 barred rock	50 Rhode Island Red		24 hrs.	All killed by hen.
	chicks, 21 days	chicks, 1 day old			
1	Pekin—3 pekin				
	ducklings, 10 days	1 mallard, 1 day	8	15 min.	Actively rejected.
	11 days	1 mallard, 2 days	8	15 min.	Actively rejected.
	21 days	1 pekin, 3 days	2	30 min.	Actively rejected.
	21 days	1 chick, 25 days	3	30 min.	Actively rejected.
8	Rhode Island red				
	13 mallard, 1 day	2 black duck, 6 days	7	—	Accepted at once.
	11 days	1 pekin 20 days	1	30 min.	Actively rejected.
	21 days	1 pekin 12 days	2	30 min.	Actively rejected.
13	Barred rock hen				
	5 muscovy	5 barred rock, 1 day		5 days	Actively rejected, then ac-
	2 pekin, 1 day	from hatchery			cepted, but even then occa-
					sionally pecked by mother.
13	Barred rock hen	1 barred rock chick,	15	24 hrs.	Actively rejected.
	2 pekin	18 days			
	5 muscovy				
	5 barred rock				
	chicks, 28 days				
7	Rhode Island red	2 mallard—1 day	8		Accepted at once.
	3 black duck, 7 days				

In this regard, however, the possibility should not be overlooked that while genetic factors may not determine the basic specificity of the family bond, they will come to operate secondarily as the family matures. For example, while a pair of domestic pigeons successfully hatched a bobwhite quail in our experiments, the male soon struck and killed it as it ran about the cage. In this case the work of Whitman and others (see Cushing, 1941) showing that many Columbidae will rear and foster the young of pigeons and doves from species other than their own, raises difficulties as to the correct interpretation of the genetic factors underlying the behavior of the male bird. Further work on this point will be necessary, but when one considers that mixed families have been formed between even such extremes as owls and ducklings and chicks (Nice, 1943:241), it would seem that family bonds in birds based upon non-heritable factors are of widespread occurrence.

In conclusion it may be noted that here is a case where a behavior pattern, the establishment of a highly specific bond between parents and young in birds, not only is apparently formed on a non-heritable basis, but also appears to have been so formed during much of the evolution of the group. That genetic factors have not risen more frequently

in spite of the long time involved is striking from an evolutionary view, but is probably due to the fact that it would be a rare circumstance where these would be required. Even if such genetic factors had existed, there would hardly seem to be sufficient selection pressure to prevent their disintegration through random mutation. In this regard it is of interest to note, however, that parasitic birds have used to good advantage the fact that genetic factors for the recogntion of specific young are absent in many birds (see Nice, *loc. cit.*, and the little known paper of Scott, 1904). In this case it is surprising that genetic factors for the recognition of young have not arisen in the host species for the habit of parasitism is sufficiently ancient to be correlated with the evolution of a variety of adaptive characters in parasitic groups (Friedmann, 1929).

SUMMARY

The present paper presents experiments upon heterospecific families of birds showing that such families are united by highly specific bonds, the specificity of which appears to be due to non-heritable factors rather than to genetic ones. Some comments upon the evolutionary relationships of this behavior are presented.

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SURVIVAL IN BIRDS BANDED AT THE HASTINGS RESERVATION

By JEAN M. LINSDALE

Banding of birds was one of our first undertakings after we moved, in 1937, to the Hastings Reservation. This location is in the northern part of the Santa Lucia Mountains in Monterey County, California, and about 100 miles south of Berkeley. Our banding has been restricted to the winter months or to the season when the most numerous winter visitant birds are present. We have kept within a half mile section of the canyon where living quarters of the Reservation are located. The number of traps used has been small; rarely have we been able to assemble more than twenty at one time. To cover the area suitably we have to move the traps at frequent intervals. Nearly every person who lives on the Reservation in the winter becomes interested in the trapping. At least 15 people have had a share in the operation of the traps, some of them for several seasons; and several others have helped in the study of the records. The following persons have had a part in the banding study: Janet Cahoon, Rachel Davis, F. E. Durham, R. B. Finley, Jr., J. A. Gray, Jr., R. Holdenried, P. D. Hurd, D. Linsdale, J. M. Linsdale, Mary Ann Linsdale, Hulda M. Love, J. Moojen, T. A. Riney, E. L. Sumner, Sr., L. P. Tevis, Jr., P. Q. Tomich, H. G. Weston, Jr., and L. Williams.

We had numerous objectives in thus devoting a share of our attention to trapping and banding of birds. The handling of live birds has a special value in gaining a better acquaintance with species and individuals. This applies to color and pattern and change of plumages as well as to such characteristics as size and mannerisms which are seldom, or poorly, revealed by examination at long range. The total number of birds banded in an area through a season usually differs considerably from counts or estimates, however carefully these may be made. Our estimates invariably turn out to be too low. The home areas of individuals and flocks through the winter season and changes in them are shown with remarkable accuracy by the repeated records of captures. We come to anticipate certain kinds of change as each season progresses. These local movements are characteristic for the separate species and the recognition of them is useful in the placing of the traps. For example, each spring nearly the whole population of white-crowned and golden-crowned sparrows moves up the canyon in the weeks preceding the migration and we are likely to intercept most of the birds by keeping the traps in one location. For resident species the localization of pairs before the nesting season is clearly evident. Some relations between species, such as their habits when feeding together, their characteristic means of demonstrating intolerance, and the encounters with predators, are made prominent to the bird trapper. We are able to study the external parasites, especially ticks, lice, and flies and to examine the birds for parasites in the blood. A few recoveries from a distance indicate the nature of some of the travels away from the Reservation. Finally, we get much evidence of the survival of individual birds.

In the eleven years since the fall of 1937 we have trapped and banded 5726 birds belonging to 36 species. The California quail with 248 individuals was the most numerous of the 6 non-passerine species. Birds of infrequent occurrence on the area were a Wilson snipe, a red-winged blackbird, two English sparrows, a green-tailed towhee, four white-throated sparrows, and a Harris sparrow. Special attention has been given to the 15 kinds of sparrows, and mainly to the towhees and the crowned sparrows. The 283 spotted towhees, 452 brown towhees, 1258 white-crowned sparrows, and 2749 golden-crowned sparrows make up four-fifths of the total and provide most of our material for study. The first two are strictly resident and sedentary. The second two are present in winter only and nest far to the north, mainly in Canada. For these two species there

have been more than 20,000 captures, an average of close to six for each bird. For a summary of the status of each kind of bird on the Reservation see the Condor (49: 236-241).

Table 1

Birds Banded on the Hastings Reservation, November, 1937, to June, 1948

Sharp-shinned hawk, *Accipiter striatus*	3
California quail, *Lophortyx californica*	248
Wilson snipe, *Capella gallinago*	1
Mourning dove, *Zenaidura macroura*	2
Barn owl, *Tyto alba*	2
Red-shafted flicker, *Colapter cafer*	2
Ash-throated flycatcher, *Myiarchus cinerascens*	1
California jay, *Aphelocoma californica*	62
Yellow-billed magpie, *Pica nuttallii*	12
Plain titmouse, *Parus inornatus*	21
White-breasted nuthatch, *Sitta carolinensis*	1
Wren-tit, *Chamaea fasciata*	75
House wren, *Troglodytes aedon*	9
Bewick wren, *Thryomanes bewickii*	12
California thrasher, *Toxostoma redivivum*	73
Varied thrush, *Ixoreus naevius*	2
Hermit thrush, *Hylocichla guttata*	25
Mexican bluebird, *Sialia mexicana*	1
Townsend warbler, *Dendroica townsendi*	1
English sparrow, *Passer domesticus*	2
Red-winged blackbird, *Agelaius phoeniceus*	1
Bullock oriole, *Icterus bullockii*	7
Black-headed grosbeak, *Pheucticus melanocephalus*	2
Purple finch, *Carpodacus purpureus*	16
House finch, *Carpodacus mexicanus*	20
Green-tailed towhee, *Chlorura chlorura*	1
Spotted towhee, *Pipilo maculatus*	283
Brown towhee, *Pipilo fuscus*	452
Lark sparrow, *Chondestes grammacus*	18
Oregon junco, *Junco oreganus*	233
Harris sparrow, *Zonotrichia querula*	1
White-crowned sparrow, *Zonotrichia leucophrys*	1258
Golden-crowned sparrow, *Zonotrichia coronata*	2749
White-throated sparrow, *Zonotrichia albicollis*	4
Fox sparrow, *Passerella iliaca*	63
Lincoln sparrow, *Passerella lincolnii*	20
Song sparrow, *Passerella melodia*	43
Total (36 species)	5726

Besides the small number of traps our evidence is marred by insufficient use of them. Other work makes it impracticable to attend the traps as continuously and as regularly as we would like. It is sometimes obvious that our baits do not compete satisfactorily with the foods naturally available. Some irregularity in our results comes from deviations in the weather. For example, a February snowfall may bring a swarm of birds into

the traps, but these retreat to other sections of the mountains when the ground is again uncovered. Elements of this kind must be considered in any study of the trapping results.

Five birds out of the nearly 6000 have been recovered from distant places. A white-crowned sparrow first banded on September 30, 1940, as an adult was retrapped on October 19 and 31 of the same year. It was found on the following January 14 at Salinas about 20 miles to the north where, presumably, it was picked up dead. This record shows that even though the species seems to be remarkably localized during its winter stay on the Reservation, there is a continuous shifting in the population which takes the birds to more or less distant places even before the normal time for migration. We have not yet, however, captured a white-crowned sparrow which we recognized as belonging to the resident coastal race which is abundant less than 20 miles to the west.

Three recoveries have been golden-crowned sparrows. The nearest recovery was of a bird we banded on November 21, 1944, and which on April 2, 1945, was "caught, band removed, bird released in good condition at Livermore, California" by J. W. Foster, Veterans Hospital, Livermore. This is about 90 miles north of the Reservation. We have no way to know whether this bird returned to the Reservation and was banded anew. Another bird, banded on March 24, 1942, was trapped 12 times by April 17. On April 15 of the following year this individual was recovered at the east end of Jefferson County, Washington, by Emily Scholl, of the Seattle Audubon Society. This one had gone about 800 miles toward its summer home. The third golden-crown recovery was of a bird trapped on February 6 and 9, 1939, and picked up on May 10 of the same year by George E. Darby, R. W. Large Memorial Hospital, Campbell Island P.O., Bella Bella, British Columbia. This is a little under 1000 miles from the Reservation.

A song sparrow trapped beside the stream near the buildings five times from February 19 to March 27, 1946, was found dead on March 31, 1947, by Cherie Addenin at Robles del Rio on the Carmel River about 15 miles downstream from the Reservation and 10 miles away airline. This was at the beginning of a period of dry years and the bird may have moved down the stream because of the drying up of its original home surroundings.

All these items have some bearing on our study of survival in the banded birds. Numerous others must be considered also. The trapping itself affects the survival in ways not readily measured. Injuries to birds caused by the traps seem to be infrequent and usually recovery is rapid, but some deaths must result from this source. A few birds die at the time of capture with no clue as to the cause, which may be some kind of shock. Only in rare examples does the removal of birds from the trap and handling of them result in injury or death, and this despite special experience and care on the part of the trapper. Even the most reliable trapper is capable of leaving birds exposed too long to the heat of sunshine or the cold of night or of a storm. Birds in traps attract animals to eat them. Sharp-shinned, Cooper and sparrow hawks, along with ground squirrels and chipmunks have destroyed too many of our trapped birds. They learn to watch the trap sites and they are persistent in returning to these special hunting grounds. Traps set for mammals provide an additional, artificial hazard for small birds and a few birds that have moved for short distances from the bird-trapping area have been killed in this manner. An opposite kind of influence is the extra food supplied as bait, but it is not clear how much this favors longer life.

All the losses of birds traceable to the trapping numbered 174 which amounted to only 0.03 of one per cent of the birds banded. Just half of the known deaths were caused by some animal (bird or mammal). The remainder (87) resulted from failure of the trap, exposure to weather, and miscellaneous causes. Numbers of banded birds that died as a result of the trapping or from some other recorded cause were as follows:

Golden-crowned sparrow	83	California thrasher	2
White-crowned sparrow	52	Oregon junco	2
Brown towhee	20	Yellow-billed magpie	1
Spotted towhee	7	Bullock oriole	1
California quail	4		
Song sparrow	2	Total	174

The bands may have some harmful effect on the birds from the rare injury they cause and the still rarer impediment of catching on some object like a stick or wire. They have greater importance in our learning of survival because they wear so thin as to be lost while the bird still lives. In the last year or two numerous examples of bands so worn as to be near the point of dropping off have been found. Even if these are carefully replaced when discovered, there must be some that are lost. This is not encouraging for any person considering a long program of bird banding to determine survival.

This brief outline of our trapping supplies background to review the records of survival so far accumulated. On the basis of yearly returns about half the species trapped have appeared in the traps at least a year after the time of first capture. Fifteen per cent of all the banded individuals have been still present, or have returned, at least a year after banding. This proportion is low because it is based on the total number banded and some of these were banded only this year. The numbers of survivors, of all species, for successive years were 1696, 621, 281, 139, 55, 24, 11, and 3. Expressed as ratios of the number banded in these species, the values for the years are 30.2, 11, 5, 4.8, 0.1, 0.04, 0.02, and 0.005.

Winter visitant species were listed as surviving for a year if caught in the winter season after the season of first capture. An exception is the white-crowned sparrows in which the brown head stripes are replaced in the spring; winter birds first captured with black stripes were listed as one year old at time of first capture. Resident species first

Table 2

Survival of Birds Banded on the Hastings Reservation from 1937 to 1948

			Years							
	Banded	Died	1	2	3	4	5	6	7	8
California quail	248	4	58	26	11	2	1	0	0	0
California jay	62	0	40	8	4	2	1	0	0	0
Yellow-billed magpie	12	1	4	1	1	1	0	0	0	0
Plain titmouse	21	0	6	2	0	0	0	0	0	0
Wren-tit	75	0	18	11	6	6	5	3	1	0
House wren	9	0	4	1	0	0	0	0	0	0
Bewick wren	12	0	2	2	1	0	0	0	0	0
California thrasher	73	2	15	8	2	1	1	1	0	0
Hermit thrush	25	0	10	2	1	1	0	0	0	0
Bullock oriole	7	1	1	1	0	0	0	0	0	0
Spotted towhee	283	7	94	41	25	15	6	4	1	0
Brown towhee	452	20	184	83	51	29	9	3	2	0
Oregon junco	233	2	20	19	10	5	2	1	1	1
White-crowned sparrow	1258	52	763	179	82	37	18	10	5	2
Golden-crowned sparrow	2749	83	441	214	75	35	9	0	0	0
White-throated sparrow	4	0	2	2	1	0	0	0	0	0
Fox sparrow	63	0	9	7	6	2	1	0	0	0
Song sparrow	43	2	25	15	5	3	2	2	1	0
Total	5628	174	1696	621	281	139	55	24	11	3

captured after March 1 and before young of the year appeared are listed as surviving at least one year.

Table 3

Banding Records of Crowned Sparrows on the Hastings Reservation, November, 1937, to April, 1948

	White-crowned sparrow					Golden-crowned sparrow			
Date	New im.	New ad.	Ret.	Repeat	Total	New	Ret.	Repeat	Total
1937									
Nov.	16	31	0	9	56	31	0	7	38
Dec.	11	24	0	106	141	19	0	47	66
Yr.	27	55	0	115	197	50	0	54	104
1938									
Jan.	1	1	0	23	25	0	0	4	4
Apr.	0	2	1	2	5	2	0	0	2
Oct.	66	25	28	130	249	18	4	14	36
Nov.	28	21	7	70	126	99	2	105	206
Dec.	6	9	1	47	63	69	1	88	158
Yr.	101	58	37	272	468	188	7	211	406
1939									
Jan.	4	1	8	38	51	18	2	30	50
Feb.	0	0	10	97	107	93	2	56	151
Mar.	6	4	17	33	60	20	2	28	50
Apr.	2	13	10	54	79	49	12	337	398
Nov.	0	0	1	0	1	0	0	0	0
Dec.	0	0	0	0	0	2	0	0	2
Yr.	12	18	46	222	298	182	18	451	651
1940									
Jan.	50	10	41	186	287	91	23	144	258
Feb.	4	1	4	107	116	8	8	33	49
Mar.	1	0	0	9	10	0	1	3	4
Apr.	3	13	13	89	118	27	6	131	164
Sept.	11	5	3	3	22	0	1	0	1
Oct.	80	22	38	166	306	152	35	152	339
Nov.	22	7	18	115	162	108	23	311	442
Dec.	3	0	5	36	44	32	4	93	129
Yr.	174	58	122	711	1065	418	101	867	1386
1941									
Jan.	4	2	17	43	66	39	19	118	176
Feb.	4	0	23	86	113	25	14	137	176
Mar.	6	2	35	214	257	19	18	180	217
Oct.	89	13	38	139	279	113	24	110	247
Nov.	17	0	16	228	261	25	13	116	154
Dec.	0	1	0	27	28	4	0	21	25
Yr.	120	18	129	737	1004	225	88	682	995
1942									
Jan.	15	2	14	127	158	33	16	144	193
Feb.	0	0	4	90	94	7	8	84	99
Mar.	1	5	17	281	304	86	40	383	509
Apr.	0	4	0	54	58	62	20	528	610
Sept.	8	3	0	1	12	1	0	0	1
Oct.	76	10	35	248	369	202	46	412	660
Nov.	14	3	8	101	126	66	26	309	401
Dec.	8	0	5	46	59	37	11	162	210
Yr.	122	27	83	948	1180	494	167	2022	2683
1943									
Jan.	2	0	5	47	54	34	5	441	480
Feb.	0	0	0	3	3	13	2	49	64
Mar.	5	0	4	161	170	27	3	501	531
Yr.	7	0	9	211	227	74	10	991	1075

	White-crowned sparrow					Golden-crowned sparrow			
Date	New im.	New ad.	Ret.	Repeat	Total	New	Ret.	Repeat	Total
1944									
Jan.	9	2	19	184	214	56	40	219	315
Feb.	7	3	13	133	156	52	19	476	547
Mar.	2	3	3	109	117	25	19	553	597
Apr.	0	1	0	17	18	29	5	241	275
Oct.	9	1	4	4	18	17	8	1	26
Nov.	90	4	12	191	297	131	23	126	280
Dec.	3	0	0	75	78	14	9	98	121
Yr.	120	14	51	713	898	324	123	1714	2161
1945									
Jan.	4	1	4	131	140	13	12	178	203
Feb.	4	0	4	48	56	5	5	141	151
Mar.	0	0	0	60	60	11	2	67	80
Apr.	0	0	0	0	0	2	0	4	6
Oct.	68	23	20	143	254	133	22	147	302
Nov.	11	2	14	183	210	69	27	536	632
Dec.	0	0	0	0	0	4	0	37	41
Yr.	87	26	42	565	720	237	68	1110	1415
1946									
Jan.	2	0	3	83	88	34	11	408	453
Feb.	6	1	0	117	124	25	5	343	373
Mar.	3	2	3	83	91	14	2	192	208
Apr.	0	1	1	13	15	4	1	91	96
Sept.	11	6	1	4	22	0	0	0	0
Oct.	41	16	18	69	144	129	31	116	276
Nov.	32	6	12	62	112	61	12	102	175
Dec.	0	0	1	26	27	0	1	8	9
Yr.	95	32	39	457	623	267	63	1260	1590
1947									
Jan.	0	0	0	2	2	0	0	3	3
Feb.	2	0	1	30	33	3	6	38	47
Mar.	0	0	2	7	9	4	12	17	33
Apr.	1	0	1	18	20	10	3	108	121
Oct.	53	12	24	92	181	66	19	67	152
Nov.	9	4	10	108	131	112	20	282	414
Dec.	5	0	2	50	57	40	8	245	293
Yr.	70	16	40	307	433	235	68	760	1063
1948									
Jan.	0	0	0	13	13	1	0	49	50
Feb.	0	0	1	145	146	23	0	151	174
Mar.	0	1	2	136	139	31	11	518	560
Yr.	0	1	3	284	298	55	11	718	784
Total	935	323	601	5552	7411	2749	724	10,840	14,313

For a comparison of the species each is considered separately. A California quail was recaptured after 5 years. A California jay survived at least 5 years. A yellow-billed magpie was found dead 4 years after it was first trapped. A Bewick wren was captured after 3 years. A California thrasher has been trapped in 6 years. Two wren-tits survived 5 years. A hermit thrush was trapped 4 years after its first capture. A Bullock oriole was taken after 2 years. Fifteen spotted towhees survived for 4 years and one for 7 years; 15 brown towhees were trapped after 4 years and two came into the traps after 7 years. The longest record of life span for a junco is 8 years. Nine golden-crowned sparrows returned for 5 winters and 18 white-crowned sparrows have returned after 5 years, while 5 have been captured after 7 years, and 2 lived at least 8 years. One white-throated

sparrow came back for a third winter. A fox sparrow was caught 5 years after the first capture. One song sparrow has been retrapped after 7 years.

These records show no great difference in survival between the strictly resident species and the ones which winter here after a long migration. The longest record of survival, that of the junco which was caught after 8 years, is probably that of a migrating bird. In this species we expect a prominent wave of migration in mid-March of each year. Not many individuals have been trapped and there have been few repeats, but the number of returns has been high. Only 233 have been banded but in successive years returns have numbered 20, 19, 10, 5, 2, 1, 1, and 1.

Table 4

Survival of White-crowned Sparrows

Each column shows number of birds surviving in successive winters out of those first captured in the season indicated at the head of the column. Upper number (Bk) indicates adult when first trapped; lower number (Bn) indicates young of the year. Total of birds alive each winter is indicated on the right.

	1937 1938	1938 1939	1939 1940	1940 1941	1941 1942	1942 1943	1943 1944	1944 1945	1945 1946	1946 1947	1947 1948	Total
1937	Bk 58											
1938	Bn 28											86
1938	32	73										
1939	15	112										232
1939	14	30	24									
1940	11	35	58									172
1940	8	20	4	38								
1941	8	24	31	130								263
1941	7	7	1	7	25							
1942	4	11	14	28	122							226
1942	2	2	1	1	3	16						
1943	2	7	8	9	25	113						209
1943	1	2	0	1	1	1	9					
1944	0	3	5	1	10	16	18					68
1944	0	1	0	1	0	1	1	6				
1945	1	2	3	1	6	8	5	110				146
1945		1	0	0	0	0	0	1	29			
1946		2	3	0	5	5	3	26	90			165
1946		0	0	0	0	0	0	0	6	28		
1947		1	1	0	2	2	1	15	14	87		157
1947							0	0	4	6	17	
1948							1	8	7	13	67	123

The figures for survival have more significance when the size of the original population is known and the reduction can be traced through successive years. This information is available for the white-crowned and golden-crowned sparrows, the two wintering species for which we have the most complete records. By placing the total number of new captures at the top of successive columns representing the separate years and by dropping each new year one line, a table can be made in which the columns read downward show the remainders of each year's new birds and each horizontal line shows the approximate ages of the population present each year. The more thorough the trapping the more reliable will be the figures in representing the true changes in the population.

Table 5

Survival of Golden-crowned Sparrows

Each column shows number of birds surviving in successive winters out of those first captured in the season indicated at the head of the column. Total of birds alive each winter is indicated on the right.

	1937 1938	1938 1939	1939 1940	1940 1941	1941 1942	1942 1943	1943 1944	1944 1945	1945 1946	1946 1947	1947 1948	Total
1937 1938	52											52
1938 1939	5	366										371
1939 1940	5	62	128									195
1940 1941	3	44	54	375								486
1941 1942	1	18	30	75	345							469
1942 1943		12	12	35	57	346						462
1943 1944			8	9	16	59	162					253
1944 1945			2	4	6	26	33	193				264
1945 1946				1	1	15	23	33	282			355
1946 1947					1	9	1	20	37	207		275
1947 1948						5	0	11	15	26	218	275

For these wintering species we might assume that all the birds which survive come back to the same winter home established in their first year's migration.

We know, however, that this habit is not universal, though the tendency is remarkably strong. Even in the two being considered, there is a clear difference in this respect. The golden-crowned sparrows are trapped in greater numbers each year; usually there are about twice as many as white-crowns. The proportion, however, which comes back in the second and successive years is much smaller. The percentages of second year returns for immature white-crowns range from 14.2 to 53.6 and average 27.1 for 10 years; for adults, the range is from 11.1 to 55.0, average 21.9. For golden-crowns the range is from 9.6 to 42.1, average 18.6.

Percentage of Each Year's New Birds Surviving the Second Year

	White-crown		Golden-crown
	im.	ad.	
1938-39	53.6	55.0	9.6
1939-40	31.1	41.0	17.0
1940-41	53.4	16.7	42.1
1941-42	21.5	18.4	20.0
1942-43	20.5	12.0	16.5
1943-44	14.2	6.2	17.0
1944-45	22.8	11.1	20.4
1945-46	23.6	16.7	17.4
1946-47	15.4	20.6	13.2
1947-48	15.0	21.4	12.5
Average	27.1	21.9	18.6

My conclusion from all our observations on this topic is that we are in the true wintering ground of a greater number of the white-crowns than golden-crowns captured, that the golden-crowns move on to some other location, and that in general they are less sedentary in winter. It is possible that the white-crowns really live longer, as these records seem to show, but this is not necessarily true.

The white-crowned sparrows which come to winter on the Reservation belong to races in which the young retain brown-striped heads through the first winter only. This distinction between young birds and old birds helps to show that establishment of a winter home is generally firmly fixed in the first winter. Our records show a preponderance of young birds in the new captures each season. Some of the black-striped ones may have been missed in the trapping of previous years. Some are not trapped until after the spring molt. Others may have lived in the vicinity but not far from the area trapped. The number likely to be individuals that have changed winter quarters must be small. The numbers of adults and young newly trapped each year and the ratios between them are indicated in the following summary:

	Number			Per cent	
	Adult	Young		Adult	Young
1937-38	58	28		67.4	32.6
1938-39	73	112		39.5	60.5
1939-40	24	58		29.2	70.8
1940-41	38	130		22.6	77.4
1941-42	25	122		17.0	83.0
1942-43	16	113		12.4	87.6
1943-44	9	18		33.3	66.7
1944-45	6	110		5.0	95.0
1945-46	29	90		24.4	75.6
1946-47	28	87		24.3	75.7
1947-48	17	67		20.1	79.9
Total	325	935	Mean	26.8	73.2

In reviewing these observations, attention is directed to the small size of the area concerned in these winter studies. A long strip of twenty acres would include every trapping station as well as the ranges on the Reservation of nearly all the individual birds concerned. When this is compared with the long line of travel, over a thousand miles for the migrant species, the remarkable effectiveness of the controls over the birds which come and stay and return repeatedly between the two homes is given special emphasis. The rigidity of these controls is further demonstrated when we realize how small a part of the whole population of each species is represented on our minute area. If 4000 crowned sparrows have wintered on our 20 acres in the last 11 years, how many have come to the 100 million acres of California? How was each of them able to find and stay in its particular home area? Before we make guesses pertaining to these questions, we need to know more about what the birds really do.

Hastings Reservation, Monterey County, California, June 28, 1948.

FROM FIELD AND STUDY

Fasting of Captive Shearwaters.—Richdale (Condor, 47, 1945:55) states that for young Sooty Shearwaters (*Puffinus griseus*) intervals between feedings are as long as ten days, and correlates this with the sometimes very distant feeding grounds of the parents. Lockley (British Birds, 23, 1930: 202-218) speaks of an enforced 12-day fast of young Manx Shearwaters (*Puffinus puffinus puffinus*) just before taking flight from the breeding grounds. With this rather remarkable fasting ability in mind, we brought two young Wedge-tailed Shearwaters (*Puffinus cuneatus pacificus*) about five weeks old back to the University of Hawaii campus from one of Oahu's small offshore islands. They were kept in separate compartments of a heavy, partly dirt-filled crate under conditions roughly comparable to their natural burrows, and their growth, vitality, and loss of weight during fasting were observed.

Neither food nor water was given to the two shearwaters for 21 days. During that time both birds lost 52 per cent of their original weight (470 and 466 grams reduced to 226 and 222 grams, respectively). The rate of loss during the first week or ten days was comparable to, although somewhat slower than, that in birds studied by Richdale (*op. cit.*: 59). The rate of loss in the captive birds slowed down markedly after approximately the first ten days, for both lost an average of 155 grams during the first ten days as compared to 83 grams in the last ten days. Ths change was visibly correlated with lessening activity and vitality.

Growth of the captive birds was considerable in spite of continued loss of weight. The wingspread increased over three inches and the length of rectrices over 1½ inches in both birds during their fasting period. The rate of growth appears to be closely comparable to that found by Richdale except during the last five days of captivity when growth was much slower or nearly stopped. One of the captive birds became noticeably quiet and weak during the last week, but the second only slightly so. Both quickly became normally energetic and altercatious when feeding was begun. The birds were returned to their offshore island shortly after this and exchanged with two well-grown young which were put in empty burrows. On the basis of Lockley's work and the evidence of the present study, it was hoped that the displaced birds would be able to complete maturation and take flight without further feeding.—FRANK RICHARDSON, *University of Nevada, Reno, Nevada, November 5, 1948.*

Starling and Rusty Blackbird Records for Boulder County, Colorado.—Although the Starling (*Sturnus vulgaris*) is no longer rare as a winter visitor in Colorado, there are still few records of this bird as a nesting species within the state. Breiding (Wilson Bull., 55, 1943:247) reported nesting Starlings in Denver on May 16, 1943, and Niedrach (Wilson Bull., 57, 1945:261) observed several nests near Barr, northeast of Denver, during the spring of 1945.

Throughout the winter of 1947-1948, I occasionally recorded three to six Starlings in a plains cottonwood river bottom five miles northeast of Boulder, Colorado. These birds remained in the vicinity into the spring; and on May 14, three nests were located in cottonwood trees around the periphery of a Great Blue Heron rookery. Young could be heard in one of the nest cavities; and all three pairs of parents were busy bringing insect food to their respective nests. This is the first nesting record of Starlings within Boulder County and perhaps is indicative of similar unrecorded occurrences throughout the eastern half of the state at the present time.

Another species new to records from Boulder County is the Rusty Blackbird (*Euphagus carolinus*), which was first observed in the same river bottom area on December 7, 1947. For a period of twenty-two days, this bird, identified as an immature female, was repeatedly seen in the vicinity of a weed-choked irrigation creek, often wading in the shallow water as it searched for food. It had the interesting habit of picking up submerged leaves with its bill, flipping them upside down on the bank, and then picking off the aquatic organisms present. Usually the bird was alone, but several times it was seen in company with Red-winged Blackbirds or Starlings. It was last noted on the afternoon of December 29. That evening, after about two weeks of fairly mild weather, a storm brought almost a foot of snow; and, with the snowfall, the bird disappeared. The last record of the Rusty Blackbird in Colorado known to me is that of Bergtold (Bird-Lore, 37, 1935:78), who recorded it in the Denver region on December 25, 1934.—R. G. BEIDLEMAN, *Department of Zoology, Colorado A. & M. College, Fort Collins, Colorado, November 27, 1948.*

Abundance of Richardson and Franklin Grouse in Idaho in 1948.—The following comments are based on field notes and specimens taken in the period of August 12 to September 3, 1948, in two counties in central Idaho. At Loon Creek Ranger Station and Indian Springs, in Custer County, and at Perkins Lake and Prairie Creek, in Blaine County, Richardson Grouse (*Dendragapus obscurus richardsonii*) were noticeably abundant, the birds being much more numerous than when observed by me in 1938-1944. It was impossible to travel far along a stream without observing one or more family groups of this species. At Loon Creek, the size of the groups and the different-sized young found together in a group indicated that at least two broods had become combined. As is usual at this time of the year, the males were higher in the mountains than were the females and young, although a few males were observed at low elevations where they came down to a stream for water in early morning or late evening. The average number of young in seven broods was four (extremes, 2-7), and the majority of the young birds were well grown, some being indistinguishable from the adults in size.

At Loon Creek Ranger Station, and at Perkins Lake, the Franklin Grouse (*Canachites franklinii*) was observed daily. There were several small springs, near Loon Creek, at which the birds drank, and at Perkins Lake there was a grove of conifers that served as a roost for these birds. Around a spring near our camp at Loon Creek, the birds were often seen in early morning and in late afternoon where they may have come to drink. No vocal sounds were heard at any time, and the birds were so tame as to allow the approach of a person to within less than an arm's length. The impression gained there was that the birds were abundant, but that because of their retiring habits, especially during the day, only a fraction of the total population was detected. For example, none was observed unless it was dislodged from immediately under a person's feet. Some birds thus disturbed flew into the trees, and others merely moved a few steps away.

A male Franklin Grouse was observed "strutting" in a road on August 17, three miles north of Loon Creek Ranger Station, followed by a female thought at the time to be of the same species. The two birds walked down the road ahead of me for some hundred yards, the male bird leading the way with wings depressed and tail held horizontally. Suddenly, the male flew for a short distance, at which time the other bird crouched motionless in the road. The female was shot and proved to be not a Franklin Grouse but a young of the year of the Richardson Grouse. This association is the first of its kind I have known.

At Perkins Lake, a roost was discovered that was utilized by Franklin Grouse. One night the birds were counted as they arrived to roost, and at least fifteen roosted in the grove of conifers roughly 100 feet by 100 feet. Again no sound was heard that was made vocally by the birds; and the count was made by hearing the beat of wings as the birds flew upward through the thick trees. No daytime groupings, or young birds, were seen at this locality. The families evidently disband early, and the birds occur singly as far as was observed during the day.—M. Dale Arvey, *Museum of Natural History, Lawrence, Kansas, November 27, 1948.*

Second Record of the Sabine Gull from Utah.—On September 26, 1948, Mr. Charles W. Lockerbie and a party were observing birds at Decker's Lake on the southwestern outskirts of Salt Lake City when through field glasses they detected a medium-sized shorebird lying out in the shallow water. The specimen was retrieved and its identity determined as an immature Sabine Gull (*Xema sabini*). It had been freshly shot by some boys. Subsequently that afternoon five Sabine Gulls were seen at the lake. As corroborative evidence, it came to the writer's attention that Mr. Floyd A. Thompson of the U. S. Fish and Wildlife Service, while investigating shooting at Decker's Lake, observed a small flock of Sabine Gulls there on the same date. Very likely these were the same birds seen by Lockerbie and party.

The specimen picked up was given to the writer for the University collection and was prepared as a study skin by Robert Selander. The only previous record for Utah to the writer's knowledge is that of Allen (Bull. Mus. Comp. Zool., 3, 1872:173) who secured a specimen at Ogden on September 28, 1871.—William H. Behle, *University of Utah, Salt Lake City, Utah, October 6, 1948.*

Black-throated Blue Warbler at Santa Barbara, California.—On October 20, 1948, while working on the wire roof of the aviary of the Santa Barbara Museum of Natural History, Santa Barbara, California, I was startled to see a Black-throated Blue Warbler (*Dendroica caerulescens*). It was a beautiful male specimen, and so intent on trying to get through the wire to the water that

it paid little attention to me. It was an exciting few minutes before it departed, as I had never seen one alive before.

As it moved about on the pen, it passed in and out of strong sunlight shining through an oak tree. When in one of these lighted areas, one could see the beautiful bluish color on the back and head. However, the most predominating and most noticeable markings of the bird were the contrast of the black throat patch and white belly. The whole head appears to be black when not in good light. Another striking mark is the white patch on the center of the primaries. This patch is quite large and very conspicuous even when the wings are closed. The tail in flight resembles that of the Audubon Warbler (*Dendroica auduboni*), showing many white patches.

The bird returned the next day, October 21, 1948, about the same time, but its actions were very different. It was feeding in oaks in typical warbler fashion, and was trailing in the company of several Townsend Warblers (*Dendroica townsendi*). I have been watching constantly since in the hope of seeing it again, but to no avail.

There is no doubt in my mind as to the identification of this bird as my view was unobstructed and there was ample time for observation. After the bird first appeared, careful notes were made, the museum study skins consulted and compared, and identification confirmed the following day when the bird returned.

According to Grinnell and Miller (Pac. Coast Avifauna No. 27, 1944:401), a female was found on the Farallon Islands in November, 1886. It was observed for three weeks and was found dead on November 17, 1886. It is now in the collection of the California Academy of Sciences. This is the only previous record of *Dendroica caerulescens* in the state of California.—WALDO G. ABBOTT, *Santa Barbara Museum of Natural History, Santa Barbara, California, November 2, 1948.*

Possible Nesting of Blue-winged Teal in the Willamette Valley, Oregon.—On May 13, 1947, I observed a female Blue-winged Teal (*Anas discors*) or Cinnamon Teal (*Anas cyanoptera*) with two young at McFadden's Swamp, Benton County, Oregon. This swamp is in the west-central portion of the Willamette Valley, thirteen miles south of Corvallis and one mile west of Highway 99W. The young were several weeks old, as they already had their juvenal plumage.

Earlier that spring, David B. Marshall, Fred G. Evenden, and I saw two male Blue-winged Teal in company with a female on two occasions. When a male Blue-winged Teal came winging in low and alighted near the female and her young, this strongly suggested a new nesting record for western Oregon. However, the male is supposed to desert the female at the time of incubation, and we have seen males of both Blue-winged and Cinnamon Teal in this area during the spring. Upon spotting me, the male Blue-winged Teal sprang into the air and coursed swiftly around in a low arc, while the female dashed to a thicket with the young, and then took off and joined the male, all the while quacking in low anxious tones to her young. Shortly afterwards, Dr. Kenneth L. Gordon, professor of zoology at Oregon State College, joined me in observing the male as he flew over the area.

Gabrielson and Jewett (Birds of Oregon, 1940) state that the Blue-winged Teal breeds regularly in small numbers through the lake basins of southeastern Oregon, but mention only a few records of its occurrence in the western part of the state.

Again, on August 13, 1947, Evenden flushed four juveniles with three adults in eclipse plumage, on one of which a developing cheek patch was evident. Also, through April and May, 1948, Marshall and Evenden saw male Blue-winged Teal in company with female teal at McFadden's Swamp.

We hope that future observations will verify this nesting record. But until a female Blue-winged Teal with eggs or young is taken, a record such as this must remain doubtful, for it is only by detailed examination in the hand that females of the Blue-winged and Cinnamon teals can be separated.—THOMAS H. MCALLISTER, JR., *Oregon State College, Corvallis, Oregon, October 25, 1948.*

A Record of the Scissor-tailed Flycatcher from the Colorado Desert.—On October 25, 1948, on the Cavanaugh Ranch about eight miles west of Indio on the Palm Springs highway, the writer saw a long-tailed, large, gray flycatcher sitting on a telephone wire by the edge of a date palm orchard. The location was some 200 yards away from a highway and on the south side of the orchard with open desert on the south and west. The writer first saw the pale-colored flycatcher from a travelling jeep and instantly recognized it as something unusual. A second or two later, as the jeep approached nearer, the bird flew off. The long forked tail was spread wide open in the take-off, and there was no question

that it was a Scissor-tailed Flycatcher (*Muscivora forficata*). Grinnell and Miller (Pac. Coast Avifauna No. 27, 1944:251) cite four records from southern coastal counties of the state, the last reported in 1937. —ERNEST R. TINKHAM, *Indio, California, November 6, 1948.*

Bird Records from the Navajo Country.—The excellent recent summary of the ornithology of northeastern Arizona and adjacent Utah by Woodbury and Russell (Bull. Univ. Utah, 35, No. 14, 1945:1-160) prompts us to publish the following supplemental records. For certain data, we are indebted to Messrs. Lyndon L. Hargrave and Keith Warren.

Callipepla squamata. Scaled Quail. *Lophortyx gambelii.* Gambel Quail. The occurrence of both species of quail near Navajo, Apache County, Arizona, seems significant. The region is a very sparsely settled one, and introduction seems unlikely. A covey of each species was seen by Wetherill in October, 1947, that of *Lophortyx* (22 birds) being much the larger. The latter may possibly have spread from south of Chambers, where quail supposedly from Texas, were liberated in 1939 or 1940. At the present time, quail possibly from this source range on the south side of the Rio Puerco from Navajo to Sanders. No introductions of *Callipepla,* however, are known to us, so these birds may be native. But we may never be sure of the original status of quail in the Navajo country.

Larus pipixcan. Franklin Gull. Two black-headed gulls soaring over Phillips' head at the reservoir east of Joseph City, April 26, 1948, were clearly seen to have black patches on the primaries subterminally. They must, therefore, have been of this species, which has been taken on the Colorado River in southeastern Utah, not far north of the Navajo country, at this season (Behle, Auk, 65, 1948:306), but is not mentioned by Woodbury and Russell. Other birds not previously recorded in the Navajo country at this season were seen the same day in the Holbrook-Joseph City region, including about 25 White-faced Glossy Ibis (*Plegadis mexicana*), 7 Lesser Scaup (*Aythya affinis*), 48 Dowitchers (*Limnodromus griseus*), 2 Lesser Yellow-legs (*Totanus flavipes*), 9 Wilson Phalaropes (*Steganopus tricolor*), and about 4 Tree Swallows (*Iridoprocne bicolor*) and 5 Bank Swallows (*Riparia riparia*).

Columba fasciata. Band-tailed Pigeon. The most definite record for the Navajo country is that of Wetherill, who saw six birds at War God Spring, Navajo Mountain, Utah, on August 1, 1932.

Geococcyx californianus. Road-runner. No valid records since 1930 are listed by Woodbury and Russell. Wetherill saw one 5 miles west of Joseph City on July 4, 1942, and another at Cibola Rock, a bit north of Lupton, in February, 1948. He also secured the remains of a skin found nailed to a barn door on the Rio Puerco near Lupton, where it had been killed in 1944 or before.

Strix occidentalis. Spotted Owl. A partial skeleton, still articulated, was found by Wetherill on an Indian ruin near Manuelito, New Mexico (a little east of Lupton, Arizona). It was sent to Dr. Alexander Wetmore for identification. He has kindly reported that, while the United States National Museum has no full skeleton of that species, he was able to identify it as *Strix occidentalis,* partly by elimination. The condition of the bones indicates that the bird had been dead for a long time, but it was not prehistoric. This owl also occurs on the Arizona side of the state line, as shown by an adult female in the Phillips collection taken in Good Luck (Lupton) Canyon, 5 miles north of Lupton, July 24, 1937, by A. W. Sanborn and Hustace H. Poor. The nearest previous points of record appear to be Navajo Mountain, Utah, and central northern and central New Mexico.

Aegolius acadicus. Saw-whet Owl. The first recent record for this general region is a mummified specimen found by Wetherill south of Lupton on January 12, 1947. It is in good condition and had probably not been dead very many months.

Colaptes auratus borealis. Yellow-shafted Flicker. One was found drowned at Cedar Ridge, 40 miles north of Cameron, Coconino County, Arizona, on May 7, 1947, by Keith Warren. Recognizing the rarity of the bird, he skinned it and presented it to the Museum of Northern Arizona. Its size (wing 160 mm.) agrees with birds from the Dakotas rather than with Alaskan birds. This is the first certain record of any Yellow-shafted Flicker for northern Arizona or any nearby area.

Sphyrapicus thyroideus. Williamson Sapsucker. There are records in the museum's files of a male seen in an aspen thicket at Kiet Siel Spring, Skeleton Mesa, on June 26, 1933, by Hargrave, and of one seen about a mile south of pueblo in Kiet Siel Canyon, on August 8, 1936, by Wetherill. These data, apparently overlooked heretofore, indicate probable breeding locally in the Tsegi Canyons. Woodbury and Russell give no summer records except for the Lukachukai Mountains.

Dendrocopos pubescens. Downy Woodpecker. A male seen in Betatakin Canyon, January 25, 1938, by Wetherill furnishes the first winter record for the Tsegi Canyon region.

Empidonax wrightii. Wright Flycatcher. A male taken by Phillips 4 miles west of Holbrook, April 25, 1948, is the first spring record for the Navajo country.

Empidonax difficilis. Western Flycatcher. Mr. Hargrave tells us the March record credited to him (p. 78) is an error, the notes evidently being transcribed under the wrong species.

Petrochelidon pyrrhonota. Cliff Swallow. Wetherill's earliest date at Lupton is April 10, 1947. Specimens taken there by Hargrave are not typical of either *tachina* or *albifrons.* Wetherill has found nests in ten different locations thereabouts. A male taken by Phillips on the south side of the Little Colorado River 3 miles west of Holbrook on April 26, 1948, proved to be a very fat migrant of *P. p. hypopolia,* which race has not previously been taken in the Navajo country or elsewhere in northern Arizona.

Corvus brachyrhynchos. Crow. The specimen taken at Kayenta was obtained in November (not March), 1937. Phillips was responsible for misleading Drs. Woodbury and Russell on this point. Wetherill saw a crow at the lake west of Kayenta on June 14, 1937, and remarks that it was the first one seen near Kayenta in several years. The only crows seen in his three years at Lupton were on November 11, 1947, when a flock of 40 flew south overhead at 11:15 a.m. These winter birds are presumably *hesperis,* like the specimen (which was measured); but the occasional summer birds have not been determined racially.

Nucifraga columbiana. Clark Nutcracker. A desert record station for the 1935 flight is Kayenta, where a flock of eight was reported to Wetherill in the early part of November. He saw others in Tsegi Canyon August 6-8, 1935, and in Kiet Siel Canyon on May 4, 1936. It may also be noted that the female taken on August 4 was obtained in 1935 (not 1936). In 1937, Wetherill was at Betatakin Canyon from May to December, but noted nutcrackers only once: four birds seen on September 16. This is further proof that the numbers in 1935-36 were unusual.

Thryomanes bewickii. Bewick Wren. Although the majority of these wrens retire to the south or to desert localities (such as Tuba City) in winter, a single bird was still present among the pigmy conifers near Lupton on November 14, 1947 (Phillips).

Hylocichla guttata. Hermit Thrush. A male taken by Phillips four miles west of Holbrook, April 25, 1948, is referable to *H. g. sequoiensis* (or "*dwighti,*" if that name can be upheld). It measures: wing, 94.8 mm., tail, 74.5. Bill size is about as in *H. g. guttata,* but it is slightly darker grayish brown above. This is the first definite record of any migrant Hermit Thrush in the Navajo country.

Myadestes townsendi. Townsend Solitaire. Wetherill saw two at War God Spring, Navajo Mountain, on July 1 and 2, 1937. There are no previous records for this mountain.

Bombycilla cedrorum. Cedar Waxwing. Hargrave saw a flock of about 15 in lower Oraibi, Navajo County, Arizona, on November 15, 1936. There are no other fall or winter records for the Navajo country.

Lanius ludovicianus. Loggerhead Shrike. A dark-looking female was taken by Phillips near the reservoir east of Joseph City on November 27, 1946. It proved to be of the race *gambeli,* which is thus added to the Navajo country list.

Sturnus vulgaris. Starling. The first Arizona record was a flock seen by Wetherill at Three Hogans, 3 miles west of Lupton, in May, 1946. At least 26 were seen by Phillips in the same region on November 27, 1946, but there are no other records for the Lupton area. In the Holbrook-Joseph City area, Starlings must have arrived much earlier, as they were abundant by November, 1946. On November 27, Phillips saw several hundred there, which flew off toward the west; soon afterward, a flock estimated to contain a thousand Starlings flew back eastward. This last flight, at 5:00 p.m., may have contained the birds seen previously. Again, on November 15, 1947, Phillips saw about 60 Starlings near the reservoir east of Joseph City. Monson (Condor, 50, 1948:45) has also reported Starlings seen in this vicinity. This is evidently the only area in Arizona where they are now common.

Oporornis tolmiei. MacGillivray Warbler. An early migrant was seen 4 miles west of Holbrook on April 25, 1948 (Phillips). At this date, the commonest bird in the brush along the Little Colorado River was the Pileolated Warbler (*Wilsonia pusilla*), of which about 35 were seen in three hours. Two Bullock Orioles (*Icterus bullockii*) were also seen. None of these birds had been previously recorded so early in the Navajo country.

Molothrus ater. Brown-headed Cowbird. A singing male taken by Phillips 4 miles west of Holbrook on April 25, 1948, is *artemisiae*. The museum series from the northeast slopes of the San Francisco Mountain region, however, is *obscurus*. The line of separation of the two races thus appears to be a north-south one in the western part of the Navajo country.

Spinus pinus. Pine Siskin. The large autumn flocks have been seen as early as August 6, 1937 (about 30 in Tsegi Canyon), and September 27, 1937 (about 20 in Kiet Siel Canyon, Tsegi Canyons) by Wetherill, and as late as November 14 and 15, 1947, by Phillips (about 45 at Lupton and about 10 near Holbrook). No specimens are available to determine the race or races represented.

Spinus tristis. American Goldfinch. Probably winters at Lupton, where about five were seen with Siskins on November 14, 1947, and near Holbrook, where up to about eight birds were seen on all Phillips's visits (November 15, 1947, and April 25-26, 1948). There are few previous records for the region at any season.

Pipilo fuscus. Brown Towhee. Up to six birds were seen regularly at Lupton in the winter of 1946-47 (Wetherill). A pair was seen in the same vicinity on November 14, 1947 (Wetherill, Phillips), and one was taken, which proved to be typical *mesoleucus*. Probably the species is a permanent resident there, although not yet detected in summer. The species is not mentioned by Woodbury and Russell.

Calamospiza melanocorys. Lark Bunting. A male was seen by Phillips on April 26, 1948, on the south side of the Little Colorado River 3 miles west of Holbrook. This is the third individual reported in the entire region.

Junco oreganus. Oregon Junco. Woodbury and Russell assign their birds to the race *shufeldti*, as defined by Miller. While this may be true of the migrants in the University of Utah collection, the winter birds in the Museum of Northern Arizona are his *montanus*. The only one that is at all doubtful is no. Z8.267, which appears to be a female *montanus*, although sexed as a male. Also, a female taken by Wetherill near Farmington, northwestern New Mexico, on December 14, 1940, is evidently a small specimen of *montanus*. With further collecting, a small proportion of *shufeldti* may be found wintering, but it is certainly not the common race at that season.

Junco caniceps. Gray-headed Junco. The earliest record for transients is September 29, 1937, when Wetherill saw three in Betatakin Canyon. The "September" records cited by Woodbury and Russell are misprints for October.

Melospiza melodia. Song Sparrow. Woodbury and Russell, in the absence of specimens, assigned their Song Sparrow records to the race *montana*. The correctness of this prediction is proved by two winter specimens taken east of Farmington, New Mexico by Wetherill, and one from west of Holbrook, Arizona by Phillips. In the latter locality, two birds were still present on April 25, 1948. —MILTON A. WETHERILL and ALLAN R. PHILLIPS, *Museum of Northern Arizona, Flagstaff, Arizona, July 25, 1948*.

Early Sexual Behavior in Flocking Robins.—Large flocks of migrating Robins (*Turdus migratorius*) gather on the campus of the University of California, Berkeley, in January and February. The flocks soon strip berry-laden bushes (chiefly *Pyracantha, Cotoneaster,* and *Photinia*) and then concentrate for feeding on the lawns. Here they space themselves evenly, reaching a maximum observed density of about 0.07 birds per square yard. Dominance is constantly in evidence; too close passage results in a peck and retreat by one of the birds. This behavior contrasts with an awakening territorial defense which is shown less frequently by a bird defending its little area of lawn with a threatening display consisting of crouching with tail feathers spread and of occasional fighting. The fighting usually consists of a rush by one of the birds, at the end of which the two birds fly up vertically, squawking, pecking, and clawing each other as reported by Price (Condor, 35:52-54). On January 25, 1949, the first of three attempts at copulation was observed. The two birds were in the top of a low bush. The top bird grasped the neck feathers of the other in its bill and mounted while the lower bird fluttered in resistance. The top bird then flew off a few feet, wiggled its tail, and commenced feeding. February 2 and 9 the same behavior was observed, this time on the lawn. The sex of these birds was not known except in one case where the coloring of the top bird was deep enough to indicate definitely that it was a male. It is regrettable that the preliminary steps in this behavior, which would have made these notes more valuable, were not observed. Blanchard (U. C. Publ. Zool., 46(1), 1941:41-42)

found no behavior of this sort in flocks of migratory White-crowned Sparrows prior to departure but had no data on behavior during migration.—HENRY E. CHILDS, JR., *University of California, Berkeley, California, February 22, 1949.*

The Name for the Wryneck Recorded from Alaska.—The first record of the Wryneck for the North American continent is that of A. M. Bailey (Birds of Arctic Alaska, Colorado Mus. Nat. Hist., pop. ser. no. 8, 1948:270) who reported one found dead on September 8, 1945, near the village of Wales at the end of the Seward Peninsula, Alaska. The specimen was sent to the United States National Museum for determination, was identified as *Jynx torquilla harterti* (Poliakov, Mess. Orn., 6, 1915:135), and was so recorded.

Several geographic races in the species *Jynx torquilla* have been proposed recently, the form *harterti* being only one of half a dozen, and there has been uncertainty as to the number that merited recognition. In view of this we have taken opportunity to revise the fairly extensive series (65 specimens) in the National Museum with results of interest. It may be observed that our results, reached independently, coincide except in some details of range with those registered recently by J. L. Peters (Check-list of Birds of the World, 6, 1948:86-87). It must be noted that the forms that can be recognized at best are only slightly differentiated and that there is a considerable range of individual variation that obscures their characters.

Briefly, there are two main groups of populations, a pale colored, larger one in the west, extending from the western countries of Europe east to Lake Baikal, Tian Shan, and Pamir, including thus Poliakov's supposed race *harterti*. This name, therefore, is to be listed as a synonym of *Jynx torquilla torquilla* as has been stated by Steinbacher (Vög. pal. Fauna, Ergänzungsband, Heft 4, January, 1935: 377). To the east is a darker group of smaller size that divides into two races. One of these, *japonica* (Bonaparte), breeding on Hokkaido and found in migration to southern Japan, is of smaller size (wing 77.5-79-1 mm.), and warmer brown color. The other, *chinensis* Hesse (Ornith. Monatsb., 6, 1911:181), breeds over a wide area from northern Manchuria, Amur and Sakhalin south to Kashmir and western and central China, in migration reaching Siam and Indochina. This is somewhat duller than *japonica* and is larger (wing 79-2-88.6 mm.). Parenthetically it is interesting to note that the resident race of Italy, *tschusii*, belongs also in the smaller, darker group, differing from the distant *chinensis*, to which it is similar in size, only in slightly warmer brown color.

The specimen from Wales, Alaska, agrees both in color and size with *chinensis*, the wing measuring 83.5 mm., and is identified now as a vagrant of that race.—ALEXANDER WETMORE *and* HERBERT FRIEDMANN, *Smithsonian Institution, Washington, D.C., December 23, 1948.*

A Hummingbird Casualty.—On April 13, 1947, I was observing the display antics of several male Allen Hummingbirds (*Selasphorus sasin*) in Tilden Regional Park, Contra Costa County, California. Directly above my point of observation was a series of telephone wires which at that point were about 20 feet above the road. Every few minutes one of the males would pass between the wires on a power dive downward. As I watched one bird, it dove straight at one of the wires and, never wavering perceptibly, struck it with an audible impact, bounced off, and fell to the road about eight feet from where I stood. Apparently death had been instantaneous.

Upon examination, the bird's left eye was found to be partially collapsed and exuding fluid. Whether this should be considered a contributory cause of the accident or a result of the impact was not clear. It seems hard to believe that a bird recently so blinded would be engaged in apparently normal courtship behavior, yet it is just as hard to visualize such tremendous concentration on the object of its diving as to cause it to fly full force straight into the relatively large wire without seeing it in time to swerve out of harm's way.—JOHN R. HENDRICKSON, *Museum of Vertebrate Zoology, Berkeley, California, November 22, 1948.*

NOTES AND NEWS

COOPER CLUB MEETINGS

SOUTHERN DIVISION

NOVEMBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held November 23, 1948, 8 p.m., 145 Allan Hancock Hall, University of Southern California, with 82 members and guests present. Minutes of the previous meeting were read and approved. The following names were proposed for membership: William Anderson, 525 Cypress Ave., Redding, Calif., by Sidney B. Peyton; Lydia S. Bowen, 841 Earlham St., Pasadena 4, Calif., by Harold Michener; Fritz R. Claxton, 2516 Etna St., Berkeley 4, Calif., by E. C. Maillard; Charles G. Davis, Jr., 1230 Estudillo Ave., San Leandro, Calif., by Seth Tilmon Bailey; Otis H. Wade, 1706 Redesdale, Los Angeles 26, Calif., by Hildegarde Howard; Loran Martin Whitelock, 118 N. Westmoreland, Los Angeles 4, Calif., by C. Oscar Reis; William Graf, San Jose State College, San Jose, Calif., Paul Douglas Hamlett, R. F. D. 1, Adams, Tennessee, Gene Thompson Hendricks, P. O. Box 422, % Phillips Petroleum Co., Lander, Wyoming, Rev. George M. Link, Michael, Illinois, Phil B. Menninger, 1724 Collins Ave., Topeka, Kansas, Thomas B. Schmidt, Jr., Valley Rd., Coatesville, Pennsylvania, and Glen E. Woolfenden, 748 St. Marks Ave., Westfield, N. J., all by C. V. Duff.

Upon motion duly made and seconded, the regular monthly meeting of the Southern Division for December was ordered vacated.

A nominating committee consisting of Ed N. Harrison, chairman, Hildegarde Howard and J. R. Pemberton was appointed.

John S. Garth exhibited an egg of the now extinct aepyornis, which was viewed with great interest.

Harold M. Hill presented the first public showing of the excellent new color film, "Wings and Talons," taken by himself and Telford Work. The film featured nests of duck hawk, Harris hawk, Cooper hawk and osprey, and was made in the interest of furthering conservation and wildlife education.—DOROTHY E. GRONER, *Secretary*.

JANUARY.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held January 25, 1949, 145 Allan Hancock Hall, University of Southern California, Los Angeles, California. The following names were proposed for membership: Fred G. Bard, Director, Prov. Museum, Normal School Bldg., Regina, Sask., Canada, William I. Campbell, 9 Barnesdale Ave., S., Hamilton, Ontario, Canada, Robert Henry Gibbs, Jr., 114 W. Thornapple St., Chevy Chase, Maryland, Theodore H. Koundakjian, 1581 Oakdale St., Pasadena 4, Calif., Ludwig J. Rowinsky, 17 Schneider Pl., Passaic, N. J., and Mrs. Roxie Collie Simpson, 6624 First St., N. W., Wash. 12, D. C., all by C. V. Duff; Verlin G. Baysinger, M.D., Lewis Memorial Hospital, Yosemite National Park, Calif., William V. Garner, 447 E. Wadsworth St., Philadelphia 19, Pennsylvania, Harry W. Hann, Dept. of Zoology, University of Michigan, Ann Arbor, Michigan, Anna D. Leatherman, Beulah College, Upland, Calif., George Joseph Mitchell, Tahsis, Vancouver Island, B. C., Canada, Sydney Porter, The White Gates, 149 Stenson Rd., Derby, England, Irma D. Rogers, 135 E. Los Angeles St., Monrovia, Calif., and Dwain W. Warner, Minnesota Mus. Nat. Hist., University of Minnesota, Minneapolis 14, Minnesota, by Sydney B. Peyton; William H. Dire, 127 N. Humphrey Ave., Oak Park, Illinois, by Arthur W. Halverson; Herbert E. Rankin, 5215 Vantage Ave., N. Hollywood, by F. N. Bassett; Mrs. Carolyn C. Atkins, 1097 Gilbert St., Redding, Calif., and James Robert Lance, 4917 Gardena St., San Diego 10, Calif., by W. Lee Chambers. The Southern Division unanimously voted Henry Ward Carriger and Fred A. Schneider to Honorary Membership.

Officers of the Southern Division for 1949 were elected as follows: Kenneth E. Stager, president; Wilson C. Hanna, first vice-president; W. J. Sheffler, second vice-president; and Dorothy E. Groner, secretary.

J. R. Pemberton, Ed N. Harrison, Hildegarde Howard, Sherwin F. Wood, W. J. Sheffler, C. V. Duff and Dorothy Groner were appointed by the president as a committee to formulate plans for the annual meeting to be held in Los Angeles on April 8, 9 and 10.

Through the courtesy of the Allan Hancock Foundation, two colored motion picture films were shown, "Life History of the Broad-tailed Hummingbird" and "Quetzal Quest."—DOROTHY E. GRONER, *Secretary*.

For Sale, Exchange and Want Column—Each Cooper Club member is entitled to one advertising notice in any issue of The Condor free. Notices of over five lines will be charged for at the rate of 25 cents per line. For this department, address SIDNEY B. PEYTON, *R. R. No. 2, Box 260, Fillmore, Calif.*

WANTED—Enlarged pictures of birds of the western United States. Write first.—C. C. BEASLEY, *614 California Ave., Santa Monica, California.*

FOR SALE—Wish to dispose of all small tools and table equipment for preparation of bird specimens in the skin form. This equipment is the best of its sort and difficult to assemble nowadays.—FRED DILLE, *822 Grand Ave., Nogales, Arizona.*

FOR SALE—A complete set of Bent's Life Histories, the first nine parts bound and the balance as issued; all in perfect condition and each copy autographed by Loye Holmes Miller. Dr. Miller is donating this set to the Club to sell, the money received to be deposited in the Endowment fund. How much will you offer?—COOPER ORNITHOLOGICAL CLUB, *Robinson Road, Topanga, California.*

FOR SALE—We have very lately received several lots of The Condor in fine second-hand condition. We can supply nearly all volumes from vol. 8 to date and will sell them postage paid at just ½ of our regular prices. This offer is limited and orders should be sent in at once.—COOPER ORNITHOLOGICAL CLUB, *Robinson Road, Topanga, California.*

WANTED—Grinnell, Bryant and Storer's "Game Birds of California," U. C. Press, Berkeley, 1918. —SETH T. BAILEY, *1424 Bay St., Alameda, California.*

WANTED—Journal of Wildlife Management, vol. 6, nos. 1-4; vol. 7, no. 1; vol. 10, nos. 3 and 4; vol. 11, nos. 1 and 4.—LOWELL ADAMS, *Forest Experiment Station, Missoula, Montana.*

PREPARATION OF MANUSCRIPTS FOR THE CONDOR

Articles published in the Condor normally are written by members of the Cooper Ornithological Club. Practically all the Club's money goes into the magazine; no editor and no business manager receive any pay other than the satisfaction of doing a service worthily. The preparation of good copy by the author will contribute greatly to accuracy of published output, dispatch in handling, and economy of production.

To be acceptable for inclusion in the Condor, articles must not duplicate in any substantial way material that is published elsewhere. Any type of subject bearing on birds may be considered; but the geographic areas of primary concern are western North America, Central America, and the Pacific Basin. Manuscripts may be submitted to any one of the editors (see inside front cover for address). Proofs with edited manuscripts will be sent to authors, at which time reprints may be ordered.

In the interests of accuracy and economy, observe the following: do not duplicate data in text, tables, or charts; check citations to original sources and verify text references; quoted statements must be exact replicas of the original; preferably use vernacular names applicable to the entire avian species (for a guide in this regard, see "The Distribution of the Birds of California," Pac. Coast Avif. No. 27, 1944:5-34); in general, avoid subspecific vernaculars; insert scientific names for species but not the subspecific name except in taxonomic papers or where the race concerned has been critically determined by the author or his collaborators; revise the manuscript repeatedly to remove superfluous words and phrases, immaterial detail, and repetitious statements.

Note Condor style and usage. "General Articles" and the "Field and Study" items are set up in different form. Provide a concise, meaningful title, and, where needed, subtitles within the text. Footnotes are not used. The address line may serve to indicate institutional connection, and to it should be added the date of transmittal of the manuscript. Terminal bibliographies are desirable where five or more titles are to be cited; otherwise, the references may be included in the text. For bibliographic style, note closely the practices employed in recent volumes of the journal. A factual summary is recommended for longer papers.

Rules for copy.—(1) typewrite material, using one side of paper only; (2) double space *all* material and leave liberal margins; (3) use 8½ × 11 inch paper of standard weight (avoid onion skin); (4) carbon copies are not acceptable; (5) place tables on separate pages; (6) number pages in upper right hand corner.

Illustrations.—Photographs should be glossy prints of good contrast. Make line drawings with India ink; plan linework and lettering for at least ½ reduction; do not use typewritten labels on the face of the drawing. Provide typed legends on separate sheets.

Helpful references on writing: Manual of Style, University of Chicago Press, and Rules of the Editorial Committee, University of California Press. On scientific nomenclature: A.O.U. Checklist (with supplements 19 through 23) and Pacific Coast Avifauna No. 27; authors are not required to follow either of these works.

THE EDITORS OF THE CONDOR.